

X. THE CARANGOID FISHES OF JAPAN.¹

By YŌJIRŌ WAKIYA.

(PLATES XV—XXXVIII)

INTRODUCTION.

In this paper the writer has undertaken to describe all the species of the carangoid fishes found in the waters of Japan, including Korea, the Bonin Islands, the Ryūkyū Islands, and Formosa. In order to this the specimens in the institutions hereinafter named have been studied. Only one species, *Ulva richardsoni* Jordan and Snyder, has failed to come under the eye of the writer, but its occurrence in the waters of Japan may be confidently asserted upon the authority of the authors of the species.

The collections which have been examined are the following:

1. The collection in the Marine Zoölogical Laboratory, College of Agriculture, Tōkyō Imperial University. It comprises specimens

¹This paper was submitted by the author for publication at the suggestion of Dr. David Starr Jordan with the understanding that the Carnegie Museum in consideration of undertaking its publication should receive all the types of the new species therein described as well as specimens of all the other species therein mentioned. With this condition the author has substantially complied. The only exceptions are the following:

Of *Trachurus argenteus* Wakiya, we received a paratype, but no figure; of *Caranx schlegeli* Wakiya we received the figured specimen, but not the type; of *Caranx tanakai* Wakiya we received a paratype and a figure of the type; of *Trachynotus cuvieri* Wakiya we received no specimen and no figure. Almost all the other species in the list were received; either the types, or figured and described specimens, with the exception of *Ulva richardsoni* Jordan and Snyder, the type of which is in the Carnegie Museum, No. 413, C. M. Cat. of Fishes.

As originally submitted, the manuscript required revision to make it accord in form with other papers published by the Carnegie Museum. Dr. David Starr Jordan read it in a preliminary way, and partially revised it, inserting a number of notes and then turned it over to the undersigned for final revision. Mr. Wakiya must be sincerely congratulated upon his knowledge of the English language and, while he will recognize that numerous minor changes in idiom have been made, yet in substance the article as published is identical in language with the manuscript, as handed over by him.

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mostly collected in the following localities: the bays of Aomori, Miyako, Sendai, and Tōkyō, and their vicinities; the coasts of Kii, Akita, and Echigo; the bays of Toyama, Uwajima, Amakusa, and Nagasaki; the coasts of Korea, including both sides, *i.e.*, on the Yellow Sea and the Japan Sea; and the seas surrounding the Bonin Islands, the Ryūkyū Islands, and the coasts of Formosa.

2. The collection in the Imperial Museum at Ueno, Tōkyō, which consists of specimens from different parts of Japan proper, the Bonin and the Ryūkyū Islands.

3. A part of the collection in Suisan-Kōsyūjo (The Imperial Fishery Institute) at Fukagawa, Tōkyō, containing specimens obtained from Formosa.

Of these collections it may be noted that the third contains the greater part of the types studied by Jordan and Evermann, when identifying the species of the carangoid fishes of Formosa, as well as those fishes enumerated by Seno in his "Report of the Fisheries in Formosa," so that the writer has been enabled to identify the specimens treated by these authors, many of which were either insufficiently described, or merely listed.

A careful examination of the specimens in the above named collections has revealed to the writer that most of the species in them were already known to science, only twelve proving to be new, while fifty-nine per cent. had already been referred to as belonging to Japan by many previous authors, such as Temminck and Schlegel, Bleeker, Günther, Steindachner and Döderlein, Jordan and his collaborators, Snyder, Seno, Smith and Pope, and Franz. It is, however, especially to be noted that the majority (about eighty-three per cent.) of the carangoid fishes occurring in Japanese waters are the species described by earlier authors, such as Linnæus, Forskål, Bloch and Schneider, Quoy and Gaimard, Cuvier and Valenciennes, Temminck and Schlegel, and Bleeker, previous to Günther's publication of his great work "A Catalogue of the Fishes in the British Museum." In the latter work some of the species are merely referred to, or are even omitted, while most of them are confused with others, from which according to the present terminology of the species they should be separated. These unfortunate conditions were either left unnoticed by later authors, or the species so treated by Günther were even described by some authors as new, without any closer examination of the literature of the subject. Accordingly it has been deemed

necessary that all of the species of carangoid fishes thus far known from Japanese waters should be submitted to a closer examination in order to verify their specific status. Therefore the writer proposes without exception to describe all of the forms of this group known in Japan, and to give their discriminative characters as clearly and as concisely as possible, so as to facilitate their comparison either with the descriptions or with the figures given by previous authors, and thus to throw some light upon the fauna of this group in Japan.

Before going further, the writer wishes to express his hearty thanks to all those who have helped him in various ways. He is under especial obligation to Prof. Chiyomatsu Ishikawa not only for his supervision and suggestions, but for his great sympathy shown toward the writer throughout the whole course of his study.

In this connection, the writer cannot close these introductory remarks without expressing his deep indebtedness to Dr. David Starr Jordan, in view of the fact that the author not only acquired his elementary knowledge of ichthyology from the study of various papers and books of Dr. Jordan, but also for the kindness of the latter in sending him some copies of the literature in his library, which have been of the utmost importance in the present studies, and which were not accessible in Japan. The writer also expresses his gratitude for the encouragement of the work shown the writer by Dr. Jordan in a private letter addressed by him to Professor Ishikawa.

Yōjirō Wakiya.

The Fifth High School,
Kumamoto, Japan,
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PISCES.

Superorder **TELEOSTEI**, Müller.

Order PERCOMORPHI Cope.

Family CARANGIDÆ Günther (*partim*).

Head more or less compressed. Premaxillaries mostly protractile. Teeth small, conical in shape, but dentition various. Gills 4; a slit behind the last; pseudobranchiæ present; branchiostegals 7. Lateral line single, more or less curved anteriorly. Dorsals 2; the spinous composed of five to eight spines, which are rather weak; anal generally preceded by two spines free from the fin; caudal deeply forked; pectorals narrow; ventrals thoracic, I. 5. Pyloric cæca usually numerous; air-bladder present. Vertebrae 10 + 14 or 15.

The fishes of this group are widely distributed throughout the seas of the temperate and tropical regions, especially abounding in warmer waters. Fourteen genera and seventy-four species of the family are with certainty known from Japan, although a closer examination may reveal others.

They are divided into four subfamilies as follows:

- a.* Lateral line armed with scutes. *Caranginæ*.
- aa.* Lateral line not armed with scutes.
 - b.* Body covered with small, cycloid scales; premaxillary protractile.
 - c.* Body much compressed; anal fin equal to soft dorsal fin; both much longer than abdomen. *Trachynotinæ*.²
 - cc.* Body not so much compressed; anal fin much shorter than soft dorsal, not longer than abdomen. *Seriolinæ*.
- bb.* Scales rudimentary, transformed into small lanceolate or linear dermal products, imbedded in the skin; posterior rays of soft dorsal and anal semidetached, forming several finlets; premaxillaries not protractile. *Scomberoidinæ*.

²From *Trachinotus* Lacépède, corrected by later authors to *Trachynotus*. D. S. JORDAN.

Subfamily CARANGINÆ.

Body oblong, ovate or rhombic in shape, either strongly compressed or scarcely so; premaxillary protractile. Dentition various. Gill-rakers normal in shape, but sometimes transformed to long feather-like filaments. Body covered with small cycloid scales. Curvature of lateral line comparatively strong in most species; scutes developed on lateral line much larger than the scales covering the body, and usually keeled and ending behind in spines. Spinous dorsal generally composed of eight spines, usually connected by membrane. Soft dorsal nearly equal to anal, with two detached spines; anal longer than abdomen. Pectorals long and falcate; ventrals usually not longer than head.

Fifty-seven species of this subfamily are represented in Japan. These belong to seven genera, which are distinguished as follows:

- a. Scutes present along whole length of lateral line. *Trachurus*.
- aa. Scutes not present along whole length of lateral line.
 - b. One or several finlets behind soft dorsal and anal.
 - c. Several finlets behind soft dorsal and anal. . . . *Megalaspis*.
 - cc. One finlet behind soft dorsal and anal. *Decapterus*.
 - bb. No finlets behind soft dorsal and anal.
 - d. Shoulder-girdle not crossed with a furrow at its junction with isthmus.
 - e. Spines of spinous dorsal eight or seven, connected with membrane; none of anterior rays of soft dorsal and anal so long as length of body.
 - f. Abdomen without a deep median groove, into which ventrals are wholly received; ventral usually much shorter than head.
 - g. Gill-rakers of moderate length and of normal shape. *Caranx*.
 - gg. Gill-rakers extremely long, and feather-like in shape. *Ulua*.
 - ff. Abdomen with a deep median groove, into which the ventrals are wholly received; ventral long, equal to head in length. *Atropus*.
 - ee. Spines of spinous dorsal smaller in number, free, rudimentary; anterior rays of soft dorsal and anal not shorter than length of body. *Alectis*.

Genus TRACHURUS Rafinesque.

Body a little compressed, elongate, oblong in shape. Head pointed, compressed. Jaws, vomer, palatines, and tongue with very fine teeth. Posterior adipose eyelid very well developed. Breast scaly. Lateral line broadly curved. Scutes about as high as diameter of eye, present along whole length of lateral line. No finlets behind soft dorsal and anal.

Three species of this genus are known from Japan.

- a. Head longer than depth; highest scutes on curved portion of lateral line not higher than those on straight portion; scutes seventy to seventy-two.
- b. Eye longer than snout; highest scutes on curved portion of lateral line lower than those on straight portion; body in life dark blue above. *japonicus*.
- bb. Eye equal to snout, or nearly so; highest scutes on curved portion of lateral line equal to those on straight portion; in life body greenish above. *argenteus*, sp. nov.
- aa. Head equal to depth; highest scutes on curved portion of lateral line somewhat higher than those on straight portion; scutes seventy-five or seventy-six; eye shorter than snout; in life body greenish blue above. *declivis*.

1. *Trachurus japonicus* (Temminck and Schlegel).

(*Kuroje*)

Caranx trachurus japonicus Temminck and Schlegel, 1844, p. 109, pl. 59, fig. 1.
Selar japonicus Bleeker, Vehr. Bat. Gen., XXVI, Ichth. van Jap., 1857, pl. 8,
 fig. 1.

Trachurus trachurus Günther, (*partim*), Cat. Fish. Brit. Mus., II, 1860, p. 419.

D. VIII-I, 31 to 33; A. II-I, 27 to 29; scutes 69 to 72 (35 or 36 + 34 to 36).

Head 3.7 in length of body (4.5 in total length); depth 4.03 (4.88); pectoral 3.17; eye 4.29 in head; snout 3.17.

Head longer than depth of body. Snout pointed, longer than eye, which is rather shorter than interorbital space; lower jaw longer than upper; maxillaries scarcely reaching anterior border of pupil. Teeth very fine; those on upper jaw imperceptible in old specimens. Lateral line becoming straight below eighth soft dorsal ray, which is at anterior quarter of fin; curved portion rather longer than straight portion, 1.1 to 1.2 times of latter. Highest scutes on curved portion of

lateral line lower than those on straight portion. Pectorals rather longer than head.

Color in formalin dark brown above, lighter below; dorsals and anal brownish; anterior part of soft dorsal white; anal and paired fins lighter; opercular spot black, distinct. Dark blue above in life.

The above description is founded upon a specimen from Uwajima, Shikoku, measuring 270 mm. in the length of the body. The proportions of the eye and of the snout in the head vary in accordance with the size of the specimens as follows:

Length of body	Eye in head	Snout in head
300 mm.	4.52 times	3.16 times
290 mm.	4.44 "	3.18 "
70 mm.	4.29 "	3.17 "
158 mm.	3.82 "	3.20 "
139 mm.	3.90 "	3.25 "
135 mm.	3.80 "	3.23 "
134 mm.	3.54 "	3.30 "

The specimens dealt with here exactly agree with the original description and the figure of this species given by Temminck and Schlegel.

The present species, as well as all other Japanese species of *Trachurus*, closely resembles *T. trachurus*, but the latter differs from all of them in having 77 (40 + 37) scutes, the eye equalling the snout in length, and contained four times in the head.

The fishes of this species approach the coast in autumn, whereas those of the other two Japanese species of *Trachurus* do so in summer. The fish is distinguished from the others in Tōkyō by the Japanese name "Kuroje," which means "black back."

Widely distributed along the coasts of Japan proper and of north-eastern Korea.

Localities:—Aomori; Miyako; Sendai Bay; Niigata; Tōkyō Bay; Kii; Uwajima; Amakusa; Fusan (Korea); Seisin (Korea).

Carnegie Museum, Cat. of Fishes, No. 7702, one specimen from Amakusa.

2. *Trachurus argenteus* Wakiya, sp. nov.

D. VIII-I, 31 to 33, A. II-I, 27 to 29; scutes 71 to 72 (35 or 36 + 34 to 36).

Head 3.77 in length of body, (4.47 in total length); depth 4.21 (5); pectoral 3.25; eye 3 in head; snout 3.35.

Head longer than depth of body. Snout rather pointed, equal to or slightly longer than eye, which is equal to interorbital space. Highest scutes on curved portion of lateral line equal to those on straight portion.

Color much lighter than that of *T. japonicus*, and body in life silvery, becoming greenish above. Otherwise similar to *T. japonicus*.

The above description is made from a specimen from Kii, measuring 215 mm. in length of body. The proportion of the eye and of the snout in the head varies in accordance with the size of the specimens as follows:

Length of body	Eye in head	Snout in head
215 mm.	3.80 times	3.35 times
205 mm.	3.92 "	3.43 "
152 mm.	3.70 "	3.25 "
159 mm.	3.48 "	3.52 "
154 mm.	3.66 "	3.52 "
150 mm.	3.33 "	3.33 "

This species closely resembles both *T. japonicus* and *T. declivis*, but is distinguishable from them in having the eye nearly equal to the snout, and the highest scutes on the curved portion of the lateral line equal to those on the straight portion.

The species is also common in Japan proper, but its distribution does not extend so far northward as that of *T. japonicus*, while it ranges to Formosa and southward.

Localities.—Tōkyō Bay; Kii; Uwajima; Amakusa; Ryūkyū; Formosa.

One specimen, Carnegie Museum, Cat. of Fishes, No. 7703, *cotype*, from Amakusa.

3. *Trachurus declivis* (Jenyns)

Caranx declivis Jenyns, Zoöl. Beagle, Fishes, 1841, p. 68, pl. 14.

Trachurus trachurus Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 419.

Trachurus japonicus Seno, Report on Fishery Industry of Formosa, 1910, pl. IX, fig. 2.

D. VIII-I, 32 or 33; A. II-I, 28 or 29; scutes 75 or 76 (40 + 35 or 36).

Head 4 in length of body (4.8 in total length); depth 4 (4.8); pectoral 3.3; eye 4 in head; snout 3.22.

Head equal to depth of body, or nearly so. Snout rather pointed, longer than eye, which is nearly equal to interorbital space. Highest scutes on curved portion of lateral line somewhat higher than those on straight portion, 1.17 times of latter.

Color much lighter than that of *T. japonicus*, and in life greenish blue above. Otherwise similar to that species.

The above description is based upon a specimen from Uwajima, Carnegie Museum, Cat. of Fishes, No. 7704, measuring 240 mm. in the length of body.

Another specimen from Amakusa attaining 310 mm. in the length of body, has the head 4 in the body, the depth 4.2, the eye 4 in the head, the snout 3.12, and 75 scutes.

The specimens dealt with here agree well with the original description and the figure of this species given by Jenyns.

The species differs from the other two Japanese species of the genus in having the depth of the body nearly equal to the length of the head, rather more numerous scutes, and the highest scutes on the curved portion of the lateral line higher than those on the straight portion. A specimen from Formosa, identified by Seno as *T. japonicus*, is certainly this species, since all the peculiarities shown in the figure given by the same author exactly correspond with those of the present species.

The species is widely distributed throughout the warmer seas of the Pacific, and is rather common in the waters of the southern coasts of Japan proper.

Localities.—Uwajima; Amakusa; Formosa.

Genus MEGALASPIS Bleeker.

Body a little compressed, elongate, oblong in shape. Head pointed, compressed. Jaws, vomer, palatines, and tongue toothed. Anterior and posterior adipose eyelids very well developed. Breast naked. Curved portion of lateral line very short. Scutes very well developed, very high, but not present along whole length of lateral line. Several finlets behind soft dorsal and anal.

Only one species is known in this genus.

4. *Megalaspis cordyla* (Linnæus)

(Pl. XV, fig. 1.)

Scomber cordyla Linnæus, Syst. Nat., 1758, I., p. 483.

Megalaspis cordyla Seno, Report on Fishery Industry of Formosa, 1910, pl. 7, fig. 1.

D. VIII-I, 10-IX or IX; A. II-I, 10-VI; scutes 50.

Head 3.9 in length of body (4.43 in total length); depth 3.9 (4.45); pectoral 3.28; eye 3.7 in head; snout 3.7.

Body not lower than length of head. Snout pointed, equal to eye;

maxillaries extending to centre of eye; lower jaw longer than upper. Anterior and posterior adipose eyelids somewhat extending beyond borders of pupil toward its centre. Teeth on upper jaw in a very narrow band; those on lower in a single series; vomer, palatines, and tongue with minute teeth. Lateral line shortly and strongly arched, becoming straight below middle of pectoral; curved portion four times in straight portion. Scutes very high, present along whole length of straight portion of lateral line; highest scutes 1.6 times of eye. Pectorals very long, about 1.2 times of head.

Color in formalin dark brown above, lighter below: fins brownish, except anal, which is pale; top of soft dorsal and posterior margin of caudal blackish; opercular spot black, distinct.

The above description is taken from a specimen from Formosa, Carnegie Museum Cat. of Fishes, No. 7705, measuring 215 mm. in the length of the body.

The species is widely distributed throughout the Indian Ocean, and the tropical seas of the Pacific. It is known to occasionally occur along the southernmost coasts of Japan proper.

Localities:—Nagasaki; Formosa.

Genus DECAPTERUS Bleeker.

Body more or less compressed, elongate, fusiform or subcylindrical in shape. Head pointed, less compressed. Teeth fine; dentition various. Adipose eyelids well developed. Shoulder-girdle crossed with a shallow furrow at its junction with isthmus. Lateral line a little curved; scutes present on straight portion of lateral line. A finlet behind soft dorsal and anal.

Six species of this genus are known from Japan.

- a. Teeth on tongue obsolete, wholly absent, or present as a mere small patch; twenty-four to twenty-six soft anal rays; fins tinged with red in life.....*russelli*.
- aa. Teeth on tongue in a band; soft anal rays twenty-six or more; fins not tinged with red in life.
- b. Vomer without a median longitudinal strip of teeth.
- c. Depth not more than 5.5 in length of body; upper jaw not toothed; maxillaries reaching midway between nostril and front border of eye; opercular membrane finely serrated....*macrosoma*.

- cc. Depth not less than 5.3 in length of body; upper jaw toothed; maxillaries reaching to front border of eye; opercular membrane not serrated. *muroadsi*.
- bb. Vomer with a median longitudinal strip of teeth.
 - d. Depth less than 5 in length of body; pectorals equal to head without snout; scutes present on posterior two-thirds of straight portion of lateral line; highest scutes not higher than half of eye. *lajang*.
 - dd. Depth more than five times in length of body; pectorals much longer than head without snout; scutes present along whole length of straight portion of lateral line; highest scute higher than half of eye.
 - e. Pectorals equal to head; thirty-five or thirty-six scutes; highest scute equal to eye; top of soft dorsal white. *maruadsi*.
 - ee. Pectorals a little shorter than head; thirty-eight scutes; highest scutes three-fourths of eye; top of soft dorsal not white. *dayi*, sp. nov.

5. *Decapterus russelli* (Rüppell)

(PL. XV, fig. 2)

(*Oaka*; *Akamuro*)

Caranx russelli Rüppell, Atl. Fisch., 1828, p. 99.

Caranx kurra, Cuvier and Valenciennes, Vol. IX, 1830, p. 44 (based on Russell's figure of *Kurra-Wodagawah*).

Decapterus kurra Bleeker, Verh. Bat. Gen., XXIV, Makr., 1852, p. 50.

Caranx kurra Günther, Cat. Fish. Brit. Mus., Vol. II, 1860, p. 429.

D. VIII-I, 30 to 32-I; A. II-I, 24 to 26-I; scutes 45.

Head 3.5 in length of body (4 in total length); depth 4.95 (5.52); pectoral 5; eye 5 in head; snout 3.

Body scarcely compressed. Snout much longer than eye, 1.66 times of it; interorbital space wider than eye, 1.25 times of it. Maxillaries scarcely reaching front border of eye; lower jaw slightly longer than upper. Teeth on each jaw in a single series; but on the upper only several at anterior end; those on vomer in two small patches at anterior end, and in a longitudinal median strip; palatines toothed; teeth on tongue obsolescent, either wholly absent, or forming a very small patch near posterior end. Posterior margin of subopercle distinctly

concave, descending obliquely forward; opercular membrane finely and sharply serrate, but only partially and indistinctly so in younger specimens. Lateral line slightly arched, becoming straight below the fourteenth soft dorsal ray, which is at middle of fin; curved portion longer than straight portion, 1.45 times of latter. Scutes distinct along nearly whole length of straight portion of lateral line; highest scutes slightly higher than half of eye. Pectorals short, equal to head without snout.

Color in formalin brown above, light below; dorsals, caudal, and pectorals brownish; anal and ventrals light; opercular spot black, distinct. In life body blue above, with a diffuse yellow longitudinal band, silvery below; snout, back, and all fins tinged with red, but caudal fin margined with yellow.

The above description is based upon a specimen from Kii, measuring 287 mm. in length of body. The proportions of the depth of the body in its length and of the eye in the head vary in accordance with the size of the specimens as follows:

Length of body	Depth in length of body	Depth in total length	Eye in head
393 mm.	4.80 times	5.40 times	5.20 times
295 mm.	4.91 times	5.53 times	5.12 times
287 mm.	4.95 times	5.52 times	4.95 times
286 mm.	4.84 times	5.50 times	4.92 times
250 mm.	4.87 times	5.58 times	4.85 times
227 mm.	5.40 times	6.20 times	4.60 times
195 mm.	5.57 times	6.30 times	4.50 times

All the specimens thus far examined exactly agree with the original description of this species given by Rüppell, as well as with that of *Caranx kurra* given by Cuvier and Valenciennes.

The specific name *russelli* is given by Rüppell to a specimen which he considered to be identical with that figured by Russell as *Kurra-Wodagawah*. The former author has so fully enumerated some of the discriminative characters of his species that by merely following him we are enabled to distinguish it easily from all other species of *Decapterus*; but, unfortunately for us, he has not mentioned any of the characters represented in Russell's figure, except the presence of the finlets and the number of the anal rays. It is perhaps the latter fact which led Cuvier and Valenciennes to consider the fish drawn by Russell as a new species, and to propose the specific name *kurra*; assigning to it the characters which may be drawn from the same figure, such as the presence of the finlets, the number of the anal

rays and of the scutes, the point where the lateral line begins to become straight, and the color of the caudal fin. Later authors without making closer study of the identification made by Rüppell of his fish with that figure, have come to use these two specific names *russelli* and *kurra* as synonymous with each other; and at least four species, quite different from one another, have been reported by authors under either one or the other of these names. Thus, Bleeker and Günther have respectively described as *kurra* (= *russelli*) a form, which well agrees with the description given by Rüppell of his species; while Day, using the same specific name, has described and figured another form, the characteristics of which are not identical with those enumerated by Rüppell. Afterwards Steindachner and Döderlein regarded *D. kiliche* (Cuvier and Valenciennes), *D. kurra* (Cuvier and Valenciennes), *D. maruadsi* (Temminck and Schlegel), and *D. kurroides* Bleeker, as synonyms of *D. russelli*. The writer is inclined to believe Rüppell was right when he considered his specimen as identical with the "Kurra-Wodagawah" of Russell. This may be concluded from the fact that the specimens dealt with here exactly agree with the description by Cuvier and Valenciennes of *kurra*, they having twenty-four to twenty-six soft anal rays, forty-six scutes, the lateral line becoming straight below the middle of the soft dorsal, and the caudal fin margined with yellow; they exactly agree, moreover, in the possession of the toothless tongue and of the red fins, with the original descriptions of Rüppell of *russelli*. There is thus no doubt that these two specific names are synonymous, and the only question is which of the two names is to be used as the specific name for the present species. According to our present laws of nomenclature, the name *russelli* must be accepted, and *kurra* regarded as its synonym; for the former is earlier than the latter. *D. kurra* of Bleeker and of Günther which agrees with the original description of *D. russelli* is certainly the present species. Both the species identified by Day with *D. kurra*, and *D. maruadsi*, which bears a close resemblance to the species of Day, cannot be the present species; for, as the writer will explain in the descriptions of those species, they contradict not only the original description of *D. russelli* in the color of all the fins and the dentition on the tongue, but also that of *D. kurra* in the number of the anal rays and of the scutes. *D. kurroides*, agreeing with *D. kiliche* in the number of the anal rays and of the scutes, seems to be a synonym of the latter species, as Steindachner and Döderlein were inclined to

think. At any rate, these two species manifestly differ from the present species in having thirty scutes, and the lateral line becoming straight below the anterior third of the soft dorsal.

This fish is known in Tōkyō by the name of "Oaka," which means "red caudal," and in Kii by "Akamuro" which means "red Decapterus."

The species is widely distributed throughout the Indian Ocean and the warm seas of the Pacific.

Localities.—Tōkyō Bay; Kii; Uwajima; Ryūkyū.

One specimen, Carnegie Museum Cat. of Fishes, No. 7706, from Tōkyō Bay.

6. *Decapterus muroadsi* (Temminck and Schlegel).

(PL. XVI, fig. 1.)

Caranx muroadsi Temminck and Schlegel, 1844, p. 108, pl. 58, fig. 1.—Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 427.

Decapterus muroadsi Bleeker, Verh. Bat. Gen. XXVI, Ichth. van Japan, 1857, p. 101.

Decapterus sanctæ-helenæ Steindachner and Döderlein, (*non* Cuvier and Valenciennes), Vol. III, 1884, p. 37, pl. IV, fig. 1.

D. VIII-I, 31 to 33-I; A. II-I, 26 to 28-I; scutes 33.

Head 4 in length of body (4.57 in total length); depth 4.7 (5.38); pectoral 4.7; eye 5.23 in head; snout 3.

Body scarcely compressed; snout much longer than eye, 1.75 times of it; interorbital space wider than eye, 1.56 times of it; lower jaw a little longer than upper; maxillaries scarcely reaching front border of eye. Teeth on each jaw in a single series, but those of upper only on anterior end; vomer with a transverse strip of teeth confined to anterior end; palatines toothed; a band of teeth on middle of posterior half of tongue. Posterior margin of subopercle concave, descending forward a little; opercular membrane not serrated. Lateral line slightly arched, becoming straight below twelfth soft dorsal ray; curved portion longer than straight portion, 1.3 times of latter. Scutes distinct along posterior five-sevenths of straight portion of lateral line; highest scutes equal to half of eye. Pectorals a little longer than head without snout.

Color in formalin dark bluish brown above, light below; spinous dorsal brown; soft dorsal gray, broadly edged with brown; caudal and pectorals gray; anal and ventrals light; opercular spot black, distinct. In life body deep blue above, silvery below; a broad reddish brown band, which turns yellow after death, running from tip of snout to base of upper lobe of caudal; top of soft dorsal, lower lobe of caudal, basal part of anal, and paired fins faintly washed with purple.

The above description is founded upon a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7707, measuring 280 mm. in the length of body. The proportions of the depth in the length of body, and of the eye in the head vary in accordance with the size of the specimens as follows:

Length of body	Depth in length of body	Depth in total length	Eye in head
335 mm.	4.50 times	5.23 times	5.40 times
280 mm.	4.70 times	5.33 times	5.25 times
223 mm.	5.00 times	5.80 times	5.00 times
160 mm.	5.13 times	5.90 times	4.50 times
152 mm.	5.20 times	6.00 times	4.33 times

The specimens dealt with here quite agree with the original description and the figure of this species given by Temminck and Schlegel.

Steindachner and Döderlein have regarded this species as a synonym of *D. sanctæ-helenæ* (Cuvier and Valenciennes). However, as the latter according to its original description has the head five times in the total length, the depth 5, the pectoral 6, the eye 4 in the head, thirty-five dorsal rays, thirty anal rays, and the lateral line marked with a series of black spots, it differs so much from the present species that this must be distinct from the Atlantic species, and the identification of this species with *D. sanctæ-helenæ* must be considered as an error.

This fish is known in Tōkyō by the Japanese name "Akaje" which means "red back."

The species is common along the warmer coasts of Japan proper, but it is not yet known from the south beyond that region.

Localities.—Tōkyō Bay; Kii; Kagoshima; Uwajima; Hamada.

7. *Decapterus macrosoma* Bleeker.

(PL. XVI, fig. 2.)

Decapterus macrosoma Bleeker, Nat. Tydschr. Nederl. Ind., I, 1851, p. 358.

Decapterus muroadsi Jordan and Evermann, (*non* Temminck and Schlegel), Proc. U. S. Nat. Mus., Vol. XXV, 1902, p. 337.—Seno, (*non* Temminck and Schlegel) Report on Fishery Industry of Formosa, 1910, p. 117.

D. VIII-I, 32 to 35-I; A. II-I, 28 to 30-I; scutes 27.

Head 3.8 in length of body (4.35 in total length); depth 5.5 (6.4); pectoral 5.55; eye 5 in head; snout 3.

Body very low, scarcely compressed. Snout much longer than eye, 1.66 times of it; interorbital space slightly wider than eye. Maxillaries reaching below a point midway between posterior nostril and front border of eye; lower jaw scarcely longer than upper. Teeth feeble; none on upper jaw; a few teeth in a single series only on anterior part of lower jaw; vomer with a transverse strip of teeth confined to its anterior end; palatines not toothed; a narrow band of teeth on the middle of posterior part of tongue. Posterior margin of subopercle somewhat concave, descending slightly forward; opercular membrane finely and bluntly serrated along whole free margin, but only partially so in young. Lateral line scarcely arched, becoming straight below thirteenth soft dorsal ray; curved portion longer than straight portion, 1.3 times of latter. Scutes distinct along posterior half of straight portion of lateral line; highest scutes two-fifths of eye. Pectorals slightly longer than head with snout.

Color in formalin dark bluish brown above, light below; dorsals and caudal brownish; distal half of soft dorsal darker; anal and paired fins light; opercular spot black, very distinct.

The above description is founded upon a specimen from the Bonin Islands, measuring 248 mm. in the length of body. The largest specimen which the writer has examined attains 350 mm. in the length of body. The proportion of the depth of the body in the length varies greatly in accordance with the size of the specimens: for example the depth of specimens measuring about 200 mm. in the length of body is 6.7 to 7 in the total length, whereas it is 6.4 in the above described specimen, which is 248 mm. in length of body, as stated. The species is represented in the Carnegie Museum by No. 7708, measuring 214 mm. to base of caudal, from the Bonin Islands.

All the specimens thus far observed agree well with the original description of this species by Bleeker, except for the number of scutes, which according to his count number sixty as against our twenty-seven. If, however, we sum up all the scales on the straight portion of the lateral line, the total number comes to sixty, keeping count of about thirty-three enlarged scales on the anterior half, and about twenty-seven bony scales bearing a spine on the posterior half. The writer, assuming that the statement made by Bleeker of the number of scutes is not correct, is inclined to give the present specific name to those specimens which accord with the description given above. Examination of a specimen from Formosa now preserved in the museum of Suisan Kōsyūjo, and which has been identified both by Jordan and Evermann and by Seno with *D. muroadsi*, reveals to the writer that it is not that species, but is in reality *D. macrosoma*.

The species is distributed throughout the tropical seas of the Pacific, occurring on the southernmost coasts of Japan proper.

Localities:—Ito and Oshima (Izu); Yaku (Satsuma); Bonin Islands; Ryūkyū; Formosa.³

8. *Decapterus lajang* Bleeker.

(PL. XVII, fig. 1.)

(*Muroaji*)

Decapterus lajang Bleeker, Ternate, V, 1855, p. 302.

Caranx muroadsi Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 427.

D. VIII-I, 34 or 35-I; A. II-I, 28 to 30-I; scutes 28.

Head 4 in length of body, (4.5 in total length); depth 5.33 (6); pectoral 6; eye 4.72 in head; snout 3.

Body a little compressed. Snout rather longer than eye; inter-orbital space equal to eye; lower jaw scarcely longer than upper; maxillaries extending to front border of eye; their posterior end rather concave, and inferiorly produced backward. Teeth on upper jaw imperceptible; those on lower in a single series; vomerine teeth in a transverse strip at anterior end, and in a longitudinal strip on middle; those of tongue in a median longitudinal band; palatines also toothed. Posterior margin of subopercle straight, descending obliquely forward; opercular membrane not serrated. Lateral line scarcely arched, becoming straight below fifteenth soft dorsal ray; curved portion longer than straight portion, 1.36 times of latter. Scutes distinct on posterior two-thirds of straight portion of lateral line; highest scutes about half of eye. Pectorals much shorter than head, equal to head without snout.

Color in formalin dark bluish brown above, light below; dorsals and caudal brown; anal and ventrals light; pectorals gray; opercular spot black, distinct. In life, body greenish blue above, silvery below; no longitudinal band.

The above description is based upon a specimen from Kii, measuring 204 mm. in length of body. The species is represented in the Carnegie Museum by No. 7709, which measures 260 mm. to base of caudal.

This species is distinct from all other species of *Decapterus* in having the maxillaries concave at the posterior end and produced backward inferiorly. Together with *D. macrosoma*, it bears a great resemblance to *D. sanctæ-helenæ* in having thirty-four or thirty-five dorsal soft rays, and twenty-eight to thirty soft anal rays, but both differ from

³A specimen from Kagoshima is referred to this species by Jordan. D. S. JORDAN.

the Atlantic species in having a longer head, a lower body, and shorter pectorals, and in the absence of a series of black spots on the lateral line.

This fish, which is generally known in Japan by the name "Muroaji," is often mistaken for *D. muroadsi*. It is, however, readily to be distinguished from the latter by the dentition on the vomer and the coloration in life, not to speak of the shape of the maxillary.

It seems to be distributed throughout the tropical seas of the Pacific, and is common in the waters of the warmer parts of Japan proper.

Localities:—Tōkyō Bay; Kii; Uwajima; Kagoshima; Bonin Islands.

9. ***Decapterus maruadsi*** (Temminck and Schlegel).

(PL. XVII, fig. 2.)

(*Aoaji*)

Caranx maruadsi Temminck and Schlegel, 1848, p. 109, pl. 158, fig. 2.—Günther, Cat. Fish. Brit. Mus., Vol. II, 1860, p. 428.

Decapterus maruadsi Bleeker, Verh. Bat. Gen., XXVI, Japan, 1857, p. 100.

Decapterus russelli Steindachner and Döderlein, (*non* Rüppell), Vol. III, 1884, pl. IV, fig. 2.

D. VIII-I, 32 to 33-I; A. II-I, 28 or 29-I; scutes 35 or 36.

Head 4 in length of body (4.6 in total length); depth 4.33 (5); pectoral 4; eye 4.4 in head, snout 2.6.

Body a little compressed. Snout much longer than eye, 1.7 times of it; interorbital space rather wider than eye, 1.2 times of it. Maxillaries scarcely reaching front border of eye; lower jaw a little longer than upper. Teeth on jaws in a single series; vomerine teeth in a transverse strip on anterior end, and in a longitudinal strip on middle; palatines toothed; a band of teeth on middle of tongue. Posterior margin of subopercle nearly straight, descending obliquely forward; opercular membrane not serrated. Lateral line somewhat strongly arched, becoming straight below fourteenth soft dorsal ray, which is nearly at middle of fin; curved portion longer than straight portion, 1.4 times of latter. Scutes well developed, present along whole length of straight portion of lateral line; highest scutes equal to eye, 4.5 in depth of body. Pectorals as long as head.

Color in formalin brownish; spinous dorsal brown; soft dorsal gray, with a broad darker margin and a white top; caudal and pectorals gray; anal and ventrals light; opercular spot black, distinct, encroaching on shoulder. In life body greenish above, silvery below; fins faintly tinged with yellow, but no parts of head, body, and fins tinged with red.

The above description is made from a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7710, measuring 247 mm. in the length of body.

The specimens dealt with here exactly agree with the original description and the figure of this species given by Temminck and Schlegel, except the proportion of the depth of the body in its length, which in this species greatly varies in accordance with the sex and the size as follows:

Length of body	Sex	Depth in length of body	Depth in total length
282 mm.	♂	4.00 times	4.64 times
247 mm.	♀	4.33 times	5.00 times
243 mm.	♀	4.50 times	5.27 times
220 mm.	♂	4.15 times	4.70 times
200 mm.	♂	4.20 times	4.80 times
200 mm.	♀	4.70 times	5.50 times
180 mm.	♂	4.17 times	4.83 times
176 mm.	♀	4.63 times	5.40 times
175 mm.	?	4.26 times	4.88 times
160 mm.	?	4.70 times	5.50 times

Thus the length, compared with the depth in the case of older male specimens, quite agrees with the figure of this species by Temminck and Schlegel, while that of younger female specimens corresponds exactly with the description by Günther, as well as with the figure by Steindachner and Döderlein of their *D. russelli* (= *D. maruadsi*).

This species can easily be distinguished from all other Japanese species of *Decapterus* by having longer pectorals, higher scutes, and the soft dorsal with a white top; and especially from *D. russelli*, which has been regarded by Steindachner and Döderlein and some other authors as synonymous with this species, by having a higher and more compressed body, the tongue with teeth in a band, the opercular membrane not serrated, rather more numerous anal rays, and the fins yellow in life, besides the other characters mentioned above.

This fish is known in Japan by the name "Aoaji" which means "blue Decapterus."

Though the species is common in the waters off the southern coasts of Japan proper, it is uncertain whether it occurs in any other regions.⁴

Localities.:—Tōkyō Bay; Kii; Uwajima; Hamada.

⁴Specimens from Hawaii are referred to this species by J. T. Nichols. D. S. JORDAN.

10. *Decapterus dayi* Wakiya, sp. nov.

(PL. XVIII, fig. 1.)

Caranx kurra Day, (*non* Cuvier and Valenciennes), Fish. India, 1867, p. 214, pl. XLVIII, fig. 5.

Decapterus macrosoma Jordan and Evermann (*non* Bleeker), Proc. U. S. Nat. Mus., Vol. XXV, 1902, p. 337.

Decapterus maruadsi Seno (*non* Temminck and Schlegel), Report on Fishery Industry of Formosa, 1910, pl. 8, fig. 3.

D. VIII-I, 32-I; A. II-I, 26 to 28-I; scutes 38.

Head 3.6 in length of body (4.2 in total length); depth 4.37 (5.1); pectoral 4; eye 3.5 in head; snout 3.3.

Body comparatively strongly compressed; thickness not more than half of head and of depth. Snout equal to, or slightly longer than, eye, which is equal to interorbital space. Lateral line somewhat strongly arched, becoming straight below twelfth soft dorsal ray, which is at anterior two-fifths of fin; curved portion a little longer than straight portion, 1.18 times of latter. Highest scutes less than eye, three-fourths of it, 5 in depth of body. Pectorals rather shorter than head, equal to distance between anterior nostril and posterior end of opercle. Top of soft dorsal not white. Otherwise similar to *D. maruadsi*.

The above description is made from the type, a specimen from Formosa, Carnegie Museum Cat. of Fishes, No. 7711, measuring 140 mm. in length of body. The number of the soft dorsal rays varies from twenty-six to twenty-eight, but is mostly twenty-seven.

The present species is surely that described and figured by Day as *kurra* (= *russelli*) from India, for, as may be known from the description given above, the specimens dealt with here quite agree with the figure by the same author. However, not only does the present species differ in the same respects from *D. russelli* as *D. maruadsi* does from the latter, but it also disagrees with the original description of *D. kurra*, Cuvier and Valenciennes, which is a synonym of *D. russelli*, in having fewer than forty-six scutes and in having the lateral line become straight at a point a little more forward than below the middle of the soft dorsal. A specimen from Formosa now preserved in the museum of Suisan-Kōsyūjo has been identified by Jordan and Richardson as *D. macrosoma*, and figured by Seno as *D. maruadsi*. However, examination of the specimen revealed to the writer that it is neither *D. macrosoma* nor *D. maruadsi*, but the present species, as can be learnt manifestly from the figure of the fish given by Seno.

Localities.—The species is widely distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is not known from Japan proper, but occurs in Formosan waters.

SELAR⁵ Bleeker.

(*Trachurops* Gill)

Body more or less compressed, rather elongated, oblong in shape. Head rather pointed, compressed. Jaws, vomer, palatines, and tongue toothed. Adipose eyelids very well developed. Shoulder-girdle crossed with a deep furrow at its junction with isthmus. Breast scaly. Lateral line broadly curved. Scutes present along whole length of straight portion of lateral line. No finlets behind soft dorsal and anal.

Three species of this genus are known from Japan.

- a. Thickness of body half of depth; teeth on upper jaw in a narrow band.
- b. Eye rather shorter than snout, and equal to interorbital space. *mauritanus*.
- bb. Eye equal to snout or nearly so, and longer than interorbital space. *macrophthalmus*.
- aa. Thickness of body 1.5 in depth; teeth on upper jaw in a single series; eye shorter than snout, and equal to interorbital space. *torvus*.

11. **Selar mauritanus** (Quoy and Gaimard).

(PL. XVIII, fig. 2.)

Caranx mauritanus Quoy and Gaimard, Voy. Uranie, Zool., 1824, p. 359.—Cuvier and Valenciennes, (*partim*), Vol. IX, 1833, p. 60.

Caranx crumenophthalmus Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II. 1860, p. 431.

Caranx torvus Steindachner and Döderlein (*non* Jenyns), Vol. IV, 1884, p. 16.

Trachurops crumenophthalmus Seno, (*non* Bloch), Report on Fishery Industry of Formosa, 1910, p. 118, pl. VI, fig. 1.—Jordan, Tanaka, and Snyder, (*partim*), Cat. Fish. Japan, 1913, p. 128.

D. VIII-I, 26; A. II-I, 23; scutes 36.

Head 3.25 in length of body (4 in total length); depth 3.54 (4.31); pectoral 3.54; eye 3.58 in head; snout 3.3.

Body much compressed, its thickness twice in the depth. Eye rather shorter than snout, equal to interorbital space. Lower jaw rather longer than upper; maxillaries extending to front border of

⁵As restricted by Jordan and Gilbert, 1882, *Caranx boöps* being taken as type. D. S. JORDAN.

pupil. Teeth of upper jaw in an exceedingly narrow band; those on lower jaw in a single series. Lateral line slightly curved, becoming straight below twelfth soft dorsal ray, which is a little before middle of fin; curved portion longer than straight portion, 1.45 times of latter. Scutes present along whole length of straight portion of lateral line, but a few anterior ones not bearing a spine; highest scutes equal to half of eye.

Color in formalin brown above, light below; spinous dorsal brown; soft dorsal, anal, and caudal, brownish; soft dorsal with darker margin; anal edged with white; pectorals gray; ventrals pale; opercular spot very faint, indistinct.

The above description is based upon a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7712, measuring 177 mm. in length of body. The proportions of the depth of the body to its length, and of the eye in the head vary in accordance with the size of the specimens; for example, in the specimens measuring 80 to 100 mm. in length of body, the depth is 5 in the total length, and the eye 3 in the head.

Among the specimens dealt with here, younger ones quite agree with the description of the type given by Cuvier and Valenciennes.

This species resembles *S. crumenophthalmus*, especially in the shape of the body, but it is distinct from the Atlantic species in having a smaller eye, longer pectorals, the teeth of the upper jaw in a band, and a very faintly marked opercular spot. A specimen from Formosa identified by Seno with *T. crumenophthalmus* is certainly this species, as is plainly to be seen from the figure given by that author. Specimens from Tōkyō Bay merely listed by Steindachner and Döderlein as *Caranx torvus* must be this species, since this is the only species of *Selar* (*Trachurops*) known from that locality.

The species is widely distributed throughout the Indian Ocean and the warm seas of the Pacific. It is common along the warmer coasts of Japan proper.

Localities:—Tōkyō Bay; Kii; Uwajima; Fusan (Korea); Ryūkyū; Formosa.

12. *Selar macrophthalmus* (Rüppell).

(PL. XVIII, fig. 3.)

Caranx macrophthalmus Rüppell, Atl. Fische, 1828, p. 97, pl. 25, fig. 4.

Caranx mauritanus Cuvier and Valenciennes, (*partim*), Vol. IX, 1833, p. 60.

Caranx crumenophthalmus Günther, (*partim*), Cat. Fish. Brit. Mus., 1860, Vol. II, p. 431.

Trachurops torva Jordan and Evermann, (*non* Jenyns), Proc. U. S. Nat. Mus., Vol. XXV, 1902, p. 337.—Seno, (*non* Jenyns), Report on Fishery Industry of Formosa, 1910, p. 118.

Trachurops crumenophthalma Jordan and Richards (*non* Bloch), Mem. Carnegie Mus., Vol. IV, 1909, p. 178.

D. VIII-I, 26; A. II-I, 22; scutes 34.

Head 3.13 in length of body (3.7 in total length); depth 3.24 (3.82); pectoral 3.4; eye 3.25 in head; snout 3.25.

Body comparatively high, much compressed; its thickness half of depth. Eye very large, equal to snout or nearly so, and longer than interorbital space. Maxillaries extending to front border of pupil. Lower jaw rather longer than upper. Teeth on upper jaw in a very narrow band; those on lower in a single series. Lateral line scarcely curved, becoming straight below twelfth soft dorsal ray, which is at middle of fin; curved portion longer than straight portion, 1.66 times of latter. Scutes present along whole length of straight portion of lateral line, but a few anterior scutes not bearing a spine; highest scute much lower than half of eye, 2.8 in it.

Coloration like that of *S. mauritanus*.

The above description is derived from a specimen from the Bonin Islands, Carnegie Museum Cat. of Fishes, No. 7713, measuring 175 mm. in length of body. In this species, the eye is very large, its diameter being only a little shorter than the snout, even in a full grown specimen; for example, a specimen from the Bonin Islands, measuring 256 mm. in length of body has the eye, which is 3.35 in the head, 1.13 in the snout, and 1.2 times of the interorbital space.

All the specimens thus far observed quite agree with the original description and the figure of this species given by Rüppell.

The present species is distinguished from all other species of *Selar* by having a higher body, a larger eye, and lower scutes. It corresponds with *S. crumenophthalmus* in having the eye not shorter than the snout, but differs from the Atlantic species in addition to the above mentioned characters in having the upper jaw with teeth in a band, longer pectorals, and an indistinct opercular spot.

Examination of a specimen from Formosa, now preserved in the Museum of Suisan-Kōsyūjo, and which has been identified by Jordan and Evermann and by Seno with *T. torva*, and by Jordan and Richardson with *T. crumenophthalmus*, reveals to the writer that it is neither of these, but the present species.

The fish is widely distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is also rarely found along the southernmost coasts of Japan proper.

Localities.—Kagoshima; Nagasaki; Ryūkyū; Bonin Islands; Formosa.

13. *Selar torvus* (Jenyns).

(PL. XIX, fig. 1.)

Caranx torvus Jenyns, Zoöl. Beagle, Fish., 1841, p. 69, pl. 15.—Günther, Cat. Fish. Brit. Mus., Vol. II, 1860, p. 431.

D. VIII-I, 25 to 27; A. II-I, 22; scutes 38.

Head 3.14 in length of body (3.88 in total length); depth 3.89 (4.64); pectoral 3.82; eye 3.7 in head; snout 3.5.

Body slightly compressed, its thickness 1.45 in depth. Eyes rather shorter than snout, equal to interorbital space. Lower jaw rather longer than upper; maxillaries extending to front border of pupil. Teeth on jaws in a single series. Lateral line scarcely curved, becoming straight below eighth soft ray of dorsal, which is at anterior third of fin; curved portion rather longer than straight portion, 1.12 times of latter. Scutes present along whole length of straight portion of lateral line, but a few anterior ones without a spine; highest scutes lower than half of eye, 2.2 in it.

Coloration like that of *S. mauritanus*.

The above description is made from a specimen from the Bonin Islands, Carnegie Museum Cat. of Fishes, No. 7714, measuring 218 mm. in length of body.

This species differs from all other species of *Selar* in having a lower and less compressed body, rather more numerous scutes, and a more shortly curved lateral line.

The species seems to be widely distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is also not rare on the southernmost coasts of Japan proper.

Localities:—Uwajima; Bonin Islands.

Genus *CARANX*⁶ Lacépède.

Body compressed, oblong or ovate in shape; back either much, or only a little, elevated. Head compressed; occipital portion usually trenchant. Dentition various. Adipose eyelids either tolerably well, or not developed. Gill-rakers mostly normal. Breast scaly or naked; cheek scaly; top of preopercle, and upper part of opercle usually

⁶It is as yet an unsettled question what species is the proper type of the genus *Caranx*. Common convenience points to *Caranx carangus-hippos* Linnæus. Rafinesque, the first reviser of the group, left the name for a group of which *Caranx ruber* has been made the logotype. Cuvier and Valenciennes made the first formal selection of a type and settled upon *Caranx trachurus*. Gill gives reasons for the selection of *Caranx speciosus* as the genotype. Pending a settlement, we may follow authors who give precedence to *Caranx carangus*, the male of which is the type of the genus *Tricopterus* Rafinesque. D. S. JORDAN.

scaled. Scutes not very high, only present on straight portion of lateral line. No finlets behind soft dorsal and anal. Ventral usually much shorter than head.

This genus has close relationship with *Selar* (*Trachurops*), *Atropus*, *Ulua*, and *Alectis*. It is distinct, however, from the first in having the normal shoulder-girdle; from the second in having the abdomen without a median groove into which the ventrals are wholly received; and from the last in having the anterior rays of the soft dorsal and of the anal much shorter than the length of the body, and the spinous dorsal connected with a membrane.

The genus is very rich in the number of species, thirty-eight being known from the waters of the warmer parts of Japan, but very rare in the north beyond the peninsula of Kinkazan on the eastern and of Noto on the western coast.

The separation of the genus into several genera, as is done by some authors, Rafinesque, Cuvier and Valenciennes, Bleeker, and Jordan and Snyder, on the ground of the prolongation of the first soft dorsal ray, on the difference of the dentition, or the shape of the gill-rakers, is in the opinion of the writer not proper, since all the genera thus proposed by these authors agree in all their essential characters, the only differences being sought in one or the other of such characters as have been just mentioned. It will be noted, however, that the dentition, which is generally regarded as one of the most important generic characters, is liable to vary to such an extent in a group furnished with such feeble teeth as the *Carangidæ*, that it is not safe to look upon it as determinative. The length of the rays of the soft dorsal is also subjected to variations which are often seen even in one and the same species. For these reasons the writer has regarded the different genera separated by the above authors from *Caranx*, merely as subgenera.

The subgenera of *Caranx* known from Japan are distinguished as follows:

- a. Both jaws toothed.
 - b. Teeth on both jaws in villiform bands.
 - c. Breast scaly..... *Carangoides*.
 - cc. Breast naked..... *Citula*.
 - bb. Teeth in lower jaw in a single series or two.
 - d. Teeth on upper jaw in a narrow band with an outer series of stronger ones; those on lower in a single series intermingled with larger ones; vomer, palatines, and tongue toothed..... *Caranx*.

- dd.* Teeth on upper jaw in a single series or two, or in a narrow band.
- e.* Tongue toothed; breast scaly; scutes normal.
- f.* Snout not much longer than eye; adipose eyelid well developed; scutes present along whole length of straight portion of lateral line. *Atule*.
- ff.* Snout much longer than eye; adipose eyelid not developed; scutes not present along whole length of straight portion of lateral line. *Longirostrum*, nom. nov.
- ee.* Vomer, palatines, and tongue not toothed; breast naked; keel on scutes produced, plate-like, ending in a spine anteriorly. . . *Uraspis*.
- aa.* Upper jaw not toothed.
 - g.* Lower jaw, vomer, palatines, and tongue toothed. *Selaroides*.
 - gg.* No teeth in adult.
 - h.* Gill-rakers normal in shape; breast scaly. *Gnathanodon*.
 - hh.* Gill-rakers feather-like in shape; breast broadly naked. *Ulua*.

Subgenus CARANGOIDES Bleeker.

Body oblong. Teeth on jaws in villiform bands; vomer, palatines, and tongue toothed. Adipose eyelid rudimentary. Breast scaly. Top of soft dorsal and of anal not prominent; no ray of fins produced into a filament.

This subgenus corresponds to a part of *Carangoides* Bleeker, who took *Carangoides plagiotænia* as the type of his genus. He, confining his attention only to the peculiar dentition of his type, was led to include in his genus, *Carangoides*, some other forms of the *Caranginæ*, which are quite different from *Caranx*, such as *Atropus*, *Alectis*, etc. The present subgenus, being defined as above, must be separated from all the other subgenera in *Caranx* or other genera in the *Caranginæ*.

Only two species of this subgenus are known from Japan.

- a.* Lower jaw prominently projecting; tips of soft dorsal and anal acute; scutes present only on posterior part of straight portion of lateral line. . . *ferdau*.

- aa. Lower jaw slightly longer than upper; tips of soft dorsal and anal not acute; scutes present along whole length of lateral line. *equula*.

14. **Caranx (Carangoides) ferdau** (Forskål).

(PL. XIX, fig. 2.)

Scomber ferdau Forskål, 1775, p. 55.

Caranx ferdau Rüppell, Atl. Fische, 1828, p. 99, pl. 25, fig. 6.—Günther, Cat. Fish. Brit. Mus., Vol. II, 1860, p. 439.

D. VIII-I, 23; A. II-I, 19; scutes 14.

Head 3.69 in length of body (4.33 in total length); depth 2.7 (3.11); pectoral 2.63; eye 4.2 in head; snout 2.68.

Body rather low; nape rather elevated, and thence descending rather rapidly and almost straight to tip of snout. Snout pointed, much longer than eye; lower jaw strongly projecting; maxillary extending beyond front border of eye. Teeth on each jaw minute, arranged in a very narrow band on side. Lateral line slightly arched, becoming straight below fourteenth soft dorsal ray; curved portion much longer than straight portion, two times of latter. Scutes small in size, less in number, only distinct on posterior third of straight portion of lateral line. Caudal peduncle with nine scutes. All parts of gill-cover scaled, only leaving naked area along free margins of interopercle and subopercle. Soft dorsal and anal pointed anteriorly; height of former 3.32 in base of fin, one-third of depth of body, equal to spinous dorsal. Pectoral much longer than head, 1.35 times of it; ventral 2.6 in head.

Color in formalin dark brown, with five large blackish transverse spots; fins gray; soft dorsal and anal with an interrupted blackish band along middle; membrane of ventral blackish; axils brown.

The above description is based upon a specimen from Ryūkyū, Carnegie Museum, Cat. of Fishes, No. 7715, measuring 240 mm. in length of body.

The specimen dealt with here exactly agrees with the description and the figure of this species given by Rüppell, though the number of soft dorsal and anal rays in his specimen are somewhat smaller than that counted by Forskål.

The species is distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is not known from Japan proper.⁷

Locality.—Ryūkyū.

⁷The species called by this name, and occurring in Hawaii, has been described by Nichols as *Carangoides jordani*. It has the lower jaw scarcely projecting, the dorsal rays 29 to 30, anal 25 to 27. D. S. JORDAN.

15. *Caranx* (*Carangoides*) *equula* Temminck and Schlegel.

(PL. XIX, fig. 3.)

Caranx equula Temminck and Schlegel, 1844, p. 111, pl. 60, fig. 1.—Günther, Cat. Fish. Brit. Mus., Vol. II, 1860, p. 438.

Carangoides equula Bleeker, Verh. Batav. Gen., XXVI, Ichthy. van Japan, 1857, p. 102.

D. VIII-I, 25; A. II-I, 23; scutes 28.

Head 3.16 in length of body (3.7 in total length); depth 2.18 (2.55); pectoral 2.56; eye 4 in head; snout 2.8.

Body rather high; profiles rather strongly and almost equally curved. Snout rather longer than eye; maxillary extending beyond front border of pupil; jaws equal, but in full grown specimens lower maxillary slightly shorter than upper. Lateral line a little arched, becoming straight below fifteenth soft dorsal ray; curved portion much longer than straight portion, 1.8 times of latter. Scutes rather small, but well armed, present along whole length of straight portion of lateral line. Caudal peduncle with seven scutes. Breast scaly; all parts of gill-cover largely scaled, except preopercle, only the top of which is scaly. Soft dorsal and anal not pointed; height of former 3.4 in base of fin, 2.44 in head, 3.6 in depth of body, almost equal to height of spinous dorsal. Pectoral longer than head, 1.23 times of it; ventral 2.28 in head.

Color in formalin brownish above, lighter below; spinous dorsal brownish; soft dorsal and anal gray, with a submarginal blackish band, which runs along, leaving a narrow white margin; caudal gray, edged with blackish posteriorly; pectoral light; ventral grayish, becoming darker toward middle; opercular spot blackish, distinct. Body crossed with six dark bands in immature stage.

The above description is founded upon a specimen from Tōkyō Bay, Carnegie Museum Cat. of Fishes, No. 7716, measuring 195 mm. in length of body.

All the specimens thus far examined agree well with the original description and the figure of this species given by Temminck and Schlegel.

This is one of the commonest species of *Caranx* in Japan and extends northward as far as Noto and Kinkwazan, but is also reported by Bleeker to occur at Batavia.

Localities.—Tōkyō Bay; Kii; Uwajima; Hamada; Tosa; Satsuma; and Formosa.

Subgenus CITULA Cuvier.

Body ovate or oblong. Soft dorsal and anal falcate anteriorly; first soft dorsal ray produced into a long filament, or not. Breast broadly naked. Otherwise similar to *Carangoides*.

The writer places in this subgenus those species of *Caranx* which agree in the dentition and in the squamation of the breast with *Caranx armatus*, the type of *Citula* Cuvier. Thus restricted, the present subgenus corresponds with those species of Bleeker's *Carangoides*, in which the ventrals are decidedly shorter than the head, the breast broadly naked, and the spinous dorsal well developed.

Thirteen species of this subgenus are known from Japan, as follows:

- a. First ray of soft dorsal produced into a long filament.
- b. Scutes more or less weakly armed, not distinct on anterior part of straight portion of lateral line.
- c. First ray of anal much shorter than that of soft dorsal.
- d. Anterior nostril nearly equal to posterior; first soft dorsal ray not longer than base of fin; ventral black.
- e. First anal ray black; ventral half of pectoral.....*armatus*.
- ee. First anal ray pale; ventral two-thirds of pectoral.....*schlegeli*, nom. nov.
- dd. Anterior nostril much smaller than posterior; first soft dorsal ray longer than base of fin; ventral pale, rather shorter than half of pectoral.....*plumbeus*.
- cc. First soft anal ray nearly as long as first dorsal ray.
 - f. Soft dorsal rays, 20 or 21; soft anal rays, 17.....*ciliaris*.
 - ff. Soft dorsal rays, 22 or 23; soft anal rays, 19.....*uii*, sp. nov.
- bb. Scutes well armed, present along whole length of straight portion of lateral line; teeth rather coarse.
 - g. Scutes thirty-five or more; caudal peduncle with six scutes.

- h. Depth not higher than 2.5 in length of body; opercular spot present.....*oblongus*.
 - hh. Depth higher than 2.5 in length of body; opercular spot absent.
 - i. Scutes forty; pectoral equal to head; anal with a black longitudinal band; ventrals distally blackish.....*deani*.
 - ii. Scutes thirty-five; pectoral 1.3 times of head; anal and ventral immaculate.....*tanakai*, sp. nov.
 - gg. Scutes twenty-five; caudal peduncle with four scutes.....*dinema*.
- aa. First ray of soft dorsal not produced into a long filament.
 - j. Soft dorsal rays not more numerous than twenty-two; anal rays not more than eighteen; breast broadly naked; free anal spines persistent.
 - k. Soft dorsal rays twenty-one or twenty-two; anal rays eighteen; dorsal profile of head curved; snout not much longer than eye.
 - l. Anterior lobe of dorsal higher than that of anal.*malabaricus*.
 - ll. Anterior lobe of soft dorsal lower than that of anal.....*cæruleopinnatus*.
 - kk. Soft dorsal rays twenty-one; anal rays sixteen; dorsal profile of head nearly straight; snout much longer than eye..*chrysophrys*.
 - jj. Soft dorsal rays thirty-one; anal rays twenty-six; breast naked inferiorly; free anal spines apparently not visible..*hemigymnostethus*.

16. *Caranx (Citula) armatus* (Forskål).

(PL. XX, fig. 1.)

Sciæna armatus Forskål, 1775, p. 53.*Caranx armatus* Cuvier and Valenciennes, Vol. IX, 1833, p. 127.—Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 453.—Seno, Report on Fishery Industry of Formosa, 1910, p. 118, pl. VII, fig. 3.

D. VIII-I, 21; A. II-I, 17; scutes 20.

Head 3.43 in length of body (4.24 in total length); depth 1.91 (2.34); pectoral 3.1; eye 4.29; snout 3.32.

Body high, ovate; nape elevated; dorsal profile rapidly curving down from occipital to tip of snout. Snout obtuse, a little longer than eye; maxillary extending to front border of pupil; lower jaw equal to upper. Teeth on jaws fine. Posterior nostril not larger than anterior. Lateral line moderately arched, becoming straight below thirteenth soft dorsal ray; curved portion longer than straight portion, 1.42 times of latter. Scutes few in number, small in size, rather weakly armed, present on posterior two-thirds of straight portion of lateral line. Caudal peduncle with eight scutes. Naked area of breast very broad, extending superiorly to base of pectoral, and posteriorly behind base of ventral. First soft dorsal ray produced into a long filament; its length 1.09 in base of fins, 1.44 times of head, 2.44 in length of body, 1.28 in depth; first soft anal ray scarcely produced, nearly half of base of fin, shorter than head, 1.33 in it. Ventral half of pectoral 1.5 both in head and in distance between its insertion and origin of soft anal.

Color in formalin brownish above, light below, crossed with six darker bands, which are especially distinct in immature specimens and lost with age; spinous dorsal brown; soft dorsal gray, with blackish first ray and narrow brown edge; caudal gray, washed with black posteriorly; anal grayish, with blackish first ray; pectoral light; ventral black; opercular spot black, distinct; axils blackish.

The above description is made from a specimen from Formosa measuring 128 mm. in the length of the body.

The specimen dealt with here exactly agrees with the description of this species given by Cuvier and Valenciennes.

The species is distributed throughout the Indian Ocean and the tropical seas of the Pacific; it is not, however, as yet certainly known from Japan proper.

Locality:—Formosa.⁸

⁸No specimen of this species was received from Mr. Wakiya. It is represented in the Carnegie Museum by a specimen from Ceylon, collected and determined by D. S. Jordan. (C. M. Cat. Fishes, No. 8067.) W. J. HOLLAND.

17. *Caranx* (*Citula*) *schlegeli* Wakiya, **nom. nov.**

(Pl. XX, fig. 2.)

Caranx ciliaris Cuvier and Valenciennes, (*non* Rüppell), Vol. IX, 1853, p. 129 (based on Russell's figure of *Tchawil-Parah*).—Temminck and Schlegel, 1844, p. 112.

Caranx armatus Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 453.

D. VIII-I, 21; A. II-I, 17; scutes 20.

Head 3.25 (3.9); depth 1.88 (2.25); pectoral 3.3; eye 3.25.

Shape like that of *C. armatus*. Snout equal to eye; maxillary extending to front border of pupil; lower jaw equal to upper. Teeth on jaws exceedingly fine. Posterior nostril not much larger than anterior. Lateral line moderately arched, becoming straight below twelfth soft dorsal ray; curved portion longer than straight portion, 1.37 times of latter. Scutes small, few in number, rather weakly armed, present only on posterior two-thirds of straight portion of lateral line. Caudal peduncle with eight scutes. Breast as broadly naked as in *C. armatus*. First ray of soft dorsal produced into a long filament, 1.2 in base of fin, 1.26 times of head, 2.6 in length of body, 1.36 in depth of body; first soft anal ray scarcely produced, equal to head and to half of base of fin. Ventral two-thirds of pectoral 1.44 in head, 1.28 in distance between its insertion and origin of soft anal.

Color in formalin similar to *C. armatus*, but anal with no black rays.

The above description is taken from a specimen from Nagasaki, 102 mm. in length. The species is represented in the Carnegie Museum by No. 7717, the figured specimen, measuring 77 mm. in length of body.

The present species is nothing more than *Caranx ciliaris* Cuvier and Valenciennes, for the specimen dealt with here agrees well with the original description. However, the writer, recognizing that this specific name is preoccupied by Rüppell, proposes the new name as a substitute for *ciliaris* C. and V.

This species closely resembles both *Caranx armatus*, and *C. plumbeus*, but differs from them in having a shorter pectoral and a rather shorter first soft dorsal ray; and especially differs from the former in having finer teeth on the jaws and a pale first anal ray, and from the latter in having the posterior nostril not much larger than the anterior, and in having the ventral black. A specimen from Nagasaki described by Temminck and Schlegel as *C. ciliaris* is certainly this species, as may be learned from the description given by the authors.

The species is distributed throughout the Indian Ocean and the warm seas of the Pacific. It is occasionally known from the southern coasts of Japan proper.

Localities.—Uwajima; Nagasaki; Formosa.

18. **Caranx (Citula) plumbeus** (Quoy and Gaimard).

(Pl. XX, fig. 3.)

Citula plumbea Quoy and Gaimard, Voy. Uranie, Zool., 1824, p. 361. Form without filamentous middle rays in soft dorsal and in anal.

Olistus malabaricus Cuvier and Valenciennes, Vol. IX, 1833, p. 137, pl. 251.

Form with filamentous middle rays in soft dorsal and in anal.

Caranx armatus Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 543.

Caranx plumbeus Jordan and Seale, Bull. U. S. Bur. Fisheries, Vol. XXV, 1906, p. 233, fig. 28. Form with filamentous middle rays in soft dorsal and in anal.

D. VIII-I, 21; A. II-I, 17; scutes 25.

Head 3.55 in length of body (4.34 in total length); depth 2 (2.41); pectoral 2.82; eye 3.68 in head; snout 2.9.

Body high, ovate; nape rather less elevated; dorsal profile evenly and strongly curving down from origin of spinous dorsal to tip of snout. Snout obtuse, rather longer than eye; maxillary extending to front border of pupil; lower jaw equal to upper. Teeth on jaws very fine. Posterior nostril much larger than anterior. Lateral line moderately arched, becoming straight below twelfth soft dorsal ray; curved portion longer than straight portion, 1.45 times of latter. Scutes small, rather few in number, tolerably well armed, present on posterior three-fourths of straight portion of lateral line; caudal peduncle with eight scutes. Breast as broadly naked as in *C. armatus*. First dorsal ray produced into a long filament, 1.2 times of base of fin, 1.7 times of head, half of length of body, equal to depth of body; first anal ray slightly prolonged into a filament, which is slightly shorter than head, and 1.46 in base of fin. Ventral shorter than pectoral, 2.4 in it, 1.9 both in head and in distance between its insertion and origin of anal.

Color in formalin similar to that of *C. armatus*, but anal with no blackish rays, ventral pale, and cross-bands on side of body lighter than those of *C. armatus*.

The above description is derived from a specimen from Kii, Carnegie Museum, Cat. of Fishes, No. 7718, measuring 144 mm. in length of body.

All the specimens thus far examined are probably females, and quite agree with the original description of this species, given by Quoy and Gaimard. *Olistus malabaricus* Cuvier and Valenciennes seems to the writer to be the male of the present species, as recognized by Jordan and Seale, since the two accord exactly with each other in detail, the difference between them being found only in the proportional length of the middle rays of the soft dorsal and of the anal.

The form of this species without filamentous middle rays in soft dorsal and in anal closely resembles both *C. armatus* and *C. schlegeli*, but these three differ from one another as follows:

	<i>C. armatus</i>	<i>C. schlegeli</i>	<i>C. plumbeus</i>
Pectoral in body length. . .	3.10 times	3.30 times	2.82 times
Ventral in pectoral.	2.00 times	1.50 times	2.37 times
Length of first ray of soft dorsal in reference to its base.	1.09 times base of fin	1.2 times base of fin	1.2 times base of fin
Anterior nostril.	equal to posterior	nearly equal to posterior	much smaller than posterior
Teeth on jaws.	fine	very fine	very fine
Color of first anal ray. . . .	blackish	pale	pale
Color of ventral.	black	black	pale

The species is widely distributed throughout the Indian Ocean, and the warmer seas of the Pacific. It is rather common in the warmer parts of Japan proper.

Localities.:—Kii; Ryūkyū; Formosa.

19. *Caranx* (*Citula*) *ciliaris* (Rüppell).

(PL. XXI.)

Citula ciliaris Rüppell, Atl. Fisch., 1828, p. 102, pl. 25, fig. 8. Form with filamentous middle rays in soft dorsal.

Caranx cirrhosus Cuvier and Valenciennes, (after Ehrenberg) Vol. IX, 1833, p. 136. Form without filamentous middle rays in soft dorsal.

Olistus rüppelli Cuvier and Valenciennes, Vol. IX, 1833, p. 144. Form with filamentous middle rays in soft dorsal.

Caranx armatus Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 453.

?*Caranx rastrosus* Jordan and Snyder, Mem. Carnegie Mus., Vol. IV, No. 2, 1909, p. 37, pl. 51. Form with filamentous middle rays in soft dorsal. (The type is in the Carnegie Museum C. M. Cat. of Fishes, No. 411, Takao, Formosa, Sauter coll. w. J. H.)

D. VIII-I, 20 or 21; A. II-I, 17, scutes 17.

Head 3.66 in length of body (4.4 in total length); depth 2.13 (2.57); pectoral 2.65; eye 3.8 in head; snout 3.

Body rather high, ovate; nape greatly elevated; head strongly curved at occipital, and thence descending rather rapidly and almost straightly to tip of snout with a slight concavity in front of nostril. Snout obtuse, rather longer than eye; maxillary extending to front border of pupil; lower jaw rather longer than upper. Teeth on jaws rather fine. Lateral line moderately arched, becoming straight below twelfth soft dorsal ray, which is at middle of fin; curved portion longer than straight portion, 1.3 times of latter. Scutes few in number, rather small in size, tolerably well armed, only present on posterior half of straight portion of lateral line. Caudal peduncle

with eight scutes. Breast as broadly naked as in *C. armatus*. Opercle scaled, with only a narrow naked area along free margin. Spines of spinous dorsal apparently seven, the first one being very small. First soft ray of dorsal, and of anal prolonged into a long filament; former longer than base of fin, 1.75 times of head, 2.22 in length of body; latter rather shorter than former, rather longer than base of fin, 1.43 times of head. Middle rays of soft dorsal not produced in female specimens, but in male filamentous and produced. Ventral 2.8 in pectoral, equal to half of head, 1.9 in distance between its insertion and origin of anal; caudal lobe 3.3 in length of body.

Color in formalin uniformly brownish; spinous dorsal blackish; soft dorsal light, with first ray and narrow edge, black; anal light, with first ray blackish; caudal gray, edged with blackish behind; paired fins light, but ventral tipped with blackish; opercular spot black, distinct; axils blackish.

The above description is made from a specimen from Formosa, measuring 220 mm. in length of body. It has been identified by Jordan and Evermann as *C. armatus*, and is now preserved in the museum of Suisan-Kōsyūjo.

The measurements of the specimens examined by the writer are as follows:

Length of body.....	220 mm.	185 mm.	140 mm.	95 mm.
Head in length of body....	3.66 times	3.40 times	3.40 times	3.45 times
Depth in length of body...	2.13 times	2.00 times	1.96 times	1.94 times
Eye in head.....	3.75 times	3.70 times	3.58 times	3.50 times
Pectoral in length of body.	2.62 times	2.57 times	2.50 times	2.60 times
Ventral in pectoral.....	2.80 times	2.67 times	2.40 times	2.35 times
Number of soft dorsal rays	21	20	20	19
Number of gill-rakers on				
lower limb.....	...	22	22	23
Longest raker in head.....	...	6.2
Middle rays of soft dorsal. not produced

The present species is certainly *Caranx cirrhosus* Cuvier and Valenciennes, for the specimens dealt with quite accord with the original description. The species also agrees exactly with the original description by Rüppell of *Citula ciliaris*, and with that of *Caranx rastrosus* by Jordan and Evermann, except that the middle rays of the soft dorsal are not filamentous. The writer is inclined in this case to consider such a difference as one of the sexual characters, and therefore the three as synonymous. The specific name of the present species should accordingly be *ciliaris* Rüppell, it having priority. The form without filamentous middle rays in the soft dorsal closely resembles the three species *C. armatus*, *C. schlegeli*, and *C. plumbeus*.

It may, however, be easily distinguished from all of them by having the first ray of the anal as long as that of the soft dorsal, and the nape much more elevated. It is differentiated from the two former by having a longer pectoral and a shorter ventral; and from the last by having the anterior nostril equal in size to the posterior.

The species is distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is not known from Japan proper.

Localities.—Ryūkyū; Formosa.

One specimen, Carnegie Museum, Cat. of Fishes, No. 7719, from Formosa, 195 mm. to base of caudal.

20. *Caranx* (*Citula*) *uii*, Wakiya, sp. nov.

(Pl. XXII, fig. 1.)

D. VIII-I, 23; A. II-I, 19; scutes 20.

Head 3.12 in length of body (3.9 in total length); depth 1.78 (2.23); pectoral 2.55; eye 4.44 in head; snout 2.66.

Body very high, shape like that of *Caranx ciliaris*, but nape less elevated. Snout obtuse, much longer than eye, 1.67 times of it; maxillary extending to front border of eye; lower jaw a little longer than upper. Teeth on jaws very fine. Lateral line moderately arched, becoming straight below sixteenth soft dorsal ray, which is at posterior third of fin; curved portion much longer than straight portion, twice the latter. Scutes small in size, few in number, weakly armed, present on posterior two-thirds of straight portion of lateral line. Breast as broadly naked as in *C. armatus*. First soft rays of dorsal and of anal almost equally prolonged; former a little longer than base of fin, 1.45 times of head, about half length of body, 1.25 in depth. Ventral one-third of pectoral, 2.5 in head, 1.82 in distance between its insertion and origin of anal.

Color in formalin brownish, light below; spinous dorsal gray; other fins light, but first soft dorsal ray blackish; opercular spot blackish; axils brown.

The above description is derived from the type, a specimen from Kii, Carnegie Museum, Cat. of Fishes, No. 7720, measuring 125 mm. in length of body. The Carnegie Museum has also received a paratype, taken at Kii, C. M. No. 7720b, measuring 105 mm. to base of caudal.

The species approaches nearer to the form *C. ciliaris* (Rüppell), which has not the produced middle rays in the soft dorsal, than any other species of the subgenus *Citula*, but differs in having the snout

much longer than the eye, and the more numerous soft rays in the dorsal and in the anal.

It is known from the waters of the warmer parts of Japan proper.

Localities.—Kii; Nagasaki; Ryūkyū.

The species is named after Mr. N. Ui, teacher of natural history in the Girls High School at Tanabe, who has supplied the writer with numerous specimens of carangoid fishes from the Province of Kii.

21. **Caranx (Citula) oblongus** (Cuvier and Valenciennes).

(PL. XXII, fig. 2.)

Caranx oblongus Cuvier and Valenciennes, Vol. IX, 1833, p. 132.—Günther (*partim*), form with forty scutes, Cat. Fish. Brit. Mus., Vol. II, 1860, p. 452.

D. VIII-I, 21; A. II-I, 18 or 19; scutes 40.

Head 3.6 in length of body (4.6 in total length); depth 2.73 (3.45); pectoral 2.6; eye 4.66 in head; snout 3.3.

Body oblong; nape much less elevated; dorsal profile evenly and gently curving down from origin of dorsal to tip of snout; ventral profile ascending forwards from origin of anal somewhat rapidly and nearly straight. Snout rather pointed, longer than eye, 1.4 times of it; maxillary scarcely reaching centre of eye; lower jaw rather longer than upper. Teeth on jaws rather coarse. Lateral line moderately arched, becoming straight below seventh soft dorsal ray; curved portion a little shorter than straight portion. Scutes numerous, well armed, present along whole length of straight portion of lateral line; caudal peduncle with six scutes. Naked area of breast rather narrow, extending scarcely to base of pectoral superiorly, and beyond base of ventral posteriorly. First soft ray of dorsal and of anal much prolonged; former twice length of head, 1.6 in length of body, 1.6 times of depth, passing beyond middle of caudal when depressed; latter a little longer than head, 3.3 in length of body, but shorter than both depth of body and base of fin. Pectoral much longer than head, 1.4 times of it.

Color in formalin uniformly brownish; dorsals and caudal gray; soft dorsal edged with brown; upper lobe of caudal darker than lower; anal and paired fins pale; opercular spot brown, distinct.

The above description is made from a specimen from Formosa, measuring 200 mm. in length of body. The proportion of the depth in the length varies somewhat largely in accordance with the size of the specimens; for example, a specimen measuring 170 mm. in length of body has the depth 2.5 in the length of body and the eye equal to the snout.

The specimens dealt with here agree with the original description of this species given by Cuvier and Valenciennes.

The species is distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is not known from Japan proper.

Localities:—Ryūkyū; Formosa.

One specimen, Carnegie Museum, Cat. of Fishes, No. 7721, from Ryūkyū.

22. **Caranx (Citula) deani** Jordan and Seale.

(Pl. XXII, fig. 3.)

Caranx deani Jordan and Seale, Proc. U. S. Nat. Mus., Vol. XXVIII, 1905, p. 776. fig. 2.

D. VIII-I, 22; A. II-I, 18; scutes 43.

Head 3.17 in length of body (4.08 in total length); depth 2.31 (3); pectoral 3.17; eye 3.57; snout 3.57.

Shape like that of *C. oblongus*, but nape rather more elevated, snout equal to eye; maxillary extending to front border of pupil. Teeth on both jaws rather stronger than those in allied species. Lateral line moderately arched, becoming straight below eighth soft dorsal ray; curved portion slightly shorter than straight portion. Scutes very numerous, well armed, present on whole length of straight portion of lateral line. Caudal peduncle with six scutes. Naked area of breast rather narrow, extending to base of pectoral superiorly, and to base of ventral posteriorly. First soft rays of dorsal and anal somewhat prolonged; both not more than length of their own bases; former 1.2 times of head, 2.5 in length of body, a little shorter than depth of body; latter a little longer than head, 3 in length of body, much shorter than depth of body. Pectoral short, equal to head.

Color in formalin brownish above, lighter below; spinous dorsal brown; soft dorsal and anal gray, each with a blackish submarginal band; caudal gray, becoming darker posteriorly; paired fins light, but ventral distally blackish; no opercular spot.

The above description is drawn from a specimen from Ryūkyū, Carnegie Museum Cat. of Fishes, No. 7722, measuring 111 mm. in length of body.

The specimen dealt with here quite agrees with the original description and the figure by Jordan and Seale of this species from the Philippines.

Though this species closely resembles *Caranx oblongus*, it distinctly differs from the latter species in having coarser teeth, a shorter pectoral, no opercular spot, the ventral washed with black distally, and the anal with a blackish submarginal band.

This species seems to be distributed throughout the warm seas of the Pacific Ocean.

Localities:—Nagasaki; Ryūkyū.

23. *Caranx (Citula) tanakai* Wakiya sp. nov.

(Pl. XXIII, fig. 1.)

Caranx oblongus Günther (*partim*), form with 36 scutes, Cat. Fish. Brit. Mus., Vol. II, 1860, p. 452.

D. VIII-I, 21; A. II-I, 18 or 19; scutes 36.

Head 3.37 in length of body (4.25 in total length); depth 2.33 (3); pectoral 2.56; eye 4.62 in head; snout 3.08.

Shape like that of *C. oblongus*. Snout rather pointed, longer than eye, 1.5 times of it; maxillary reaching front border of pupil; lower jaw rather longer than upper. Lateral line moderately arched, becoming straight below ninth soft dorsal ray; curved portion slightly longer than straight portion. Scutes rather numerous, well armed, present along whole length of straight portion of lateral line; caudal peduncle with six scutes. Breast naked as in *C. deani*. First soft dorsal ray much prolonged, equal to base of fin, 2.5 in length of body, equal to depth of body; first ray of anal scarcely produced, a little shorter than base of fin, 3.5 in length of body, much shorter than depth of body. Pectoral much longer than head, 1.3 of it.

Color in formalin brownish above, light below; upper lobe of caudal darker than lower, anal and paired fins pale; diffuse dark blotch present on opercle; opercular spot absent.

The above description is made from a specimen from Kii, measuring 197 mm. in the body length.

The species closely resembles *C. oblongus* and *C. deani*, but is decidedly distinct from either of those species, as will be seen from the following table:

	<i>C. oblongus</i>	<i>C. deani</i>	<i>C. tanakai</i>
Soft dorsal rays. . . .	21	22	21
Scutes.	40	43	36
Depth in length of body.	2.60 times	2.30 times	2.33 times
Pectoral.	much longer than head	equal to head	much longer than head
Arch of lateral line.	a little shorter than straight portion	slightly shorter than straight portion	slightly longer than straight portion
Anal.	without blackish longitudinal band	with blackish longitudinal band	without blackish longitudinal band
Ventral.	pale	blackish distally	pale
Opercular spot. . . .	present	absent	absent.

The species seems to be distributed throughout the warmer parts of the Pacific Ocean. It is rather common in the waters of the warmer parts of Japan.⁹

Localities:—Kii; Ryūkyū.

The species is named after Prof. Tanaka of the Tōkyō Imperial University.

24. **Caranx (Citula) dinema** Bleeker.

(PL. XXIII, fig. 2.)

Caranx dinema Bleeker, Makr., 1851, p. 367.

D. VIII-I, 18; A. II-I, 17; scutes 25.

Head 3.8 in length of body (4.26 in total length); depth 2.37 (3); eye 4.18 in head; snout 3.66.

Shape just like that of *Caranx deani*. Snout rather longer than eye; maxillary reaching centre of eye; lower jaw equal to upper. Teeth on jaws rather coarse. Lateral line moderately arched, becoming straight below eleventh soft dorsal ray; curved portion rather longer than straight portion, 1.16 times of latter. Scutes few in number, but large, well armed, present along whole length of straight portion of lateral line; caudal peduncle with four scutes. Breast naked as in *C. deani*. First soft ray of dorsal and of anal produced into a very long filament, former passing beyond base of caudal when depressed, 1.74 times of head, half of length of body, 1.2 times of depth; latter reaching base of caudal when depressed, 1.3 times of head, 2.65 in length of body, a little shorter than depth.

Color in formalin almost uniformly brownish; fins gray, except pectoral, which is pale; soft dorsal narrowly edged with brown; distal portion of ventral blackish; opercular spot distinct, brown.

The above description is drawn from a specimen from Ryūkyū, Carnegie Museum Cat. of Fishes, No. 7724, measuring 154 mm. in the length of body.

The species is distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is not known from Japan proper.

Locality:—Ryūkyū.

25. **Caranx (Citula) malabaricus** Bloch and Schneider.

(PL. XXIII, fig. 3.)

Scomber malabaricus Bloch and Schneider, 1801, p. 31.

Caranx malabaricus Cuvier and Valenciennes, Vol. IX, 1833, p. 121.—Jordan and Evermann, Proc. U. S. Nat. Mus., Vol. XXV, 1903, p. 337.—Seno, Report on Fish Industry of Formosa, 1910, pl. VIII, fig. 1, p. 118. (*partim*) form with twenty-two rays in soft dorsal.

⁹One specimen, Carnegie Museum Cat. of Fishes, No. 7723, cotype from Kii. W. J. HOLLAND.

D. VIII-I, 22; A. II-I, 18; scutes 25.

Head 3.15 in length of body (3.86 in total length); depth 2.07 (2.5); pectoral 2.6; eye 4 in head; snout 2.5.

Body high; nape elevated; dorsal profile strongly and evenly curving down from origin of dorsal to top of snout, with a slight concavity anterior to nostrils. Snout obtuse, a little longer than eye; lower jaw rather longer than upper; maxillary somewhat extending beyond front border of eye. Preorbital above angle of mouth lower than diameter of eye, 1.24 in it. Lateral line moderately arched, becoming straight below fourteenth ray, which is behind middle of soft dorsal; curved portion longer than straight portion, twice of latter. Scutes small in size, weakly armed, distinct along four-fifths of straight portion of lateral line; caudal peduncle with nine scutes. Naked area of breast broad, extending above base of pectoral superiorly, and beyond ventral posteriorly. None of rays in soft dorsal and anal produced into filaments. Lobe of soft dorsal 1.7 in base of fin, a little higher than that of anal, about twice of spinous dorsal, 1.3 in head, half of depth of body; caudal lobe 3 in length of body. Pectoral 1.2 times in head; ventral 2.73 in head.

Color in formalin brownish; fins almost uniformly light; soft dorsal and caudal edged faintly with blackish; opercular spot black, but, being surrounded with a large blackish blotch on opercle, it is not distinct; axils black.

The above description is drawn from a specimen from Formosa, Carnegie Museum Cat. of Fishes, No. 7725a, measuring 170 mm. in length of body.

The species is a tropical *Caranx* commonly found in the Indian Ocean and the Pacific. It is not known from Japan proper.

Locality:—Formosa.

26. *Caranx* (*Citula*) *cæruleopinnatus* Rüppell.

(Pl. XXV, fig. 1.)

Caranx cæruleopinnatus Rüppell, Atl. Fische, 1828, p. 100. (*non* Cuvier and Valenciennes, which is *Caranx melampygus*.)

Caranx malabaricus Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 439.

Caranx armatus Jordan and Evermann, (*non* Forskål), Proc. U. S. Nat. Mus., Vol. XXV, 1903, p. 337.

Caranx formosanus Jordan and Snyder, Mem. Carnegie Mus., Vol. IV, 1910, No. 2, p. 38, pl. 52. (Type in Carnegie Mus. Cat. of Fishes, No. 412.)

D. VIII-I, 23; A. II-I, 18; scutes 20.

Head 3.07 in length of body (3.6 in total length); depth 1.91 (2.28); pectoral 3; eye 4 in head; snout 2.77.

Shape of body like that of *C. malabaricus*. Snout obtuse, a little longer than eye; lower jaw slightly longer than upper; maxillary extending somewhat beyond front border of eye; preorbital at angle of mouth lower than diameter of eye, 1.5 in it. Lateral line moderately arched, becoming straight below fifteenth soft dorsal ray, which is behind posterior third of fin; curved portion much longer than straight portion, 2.2 times of latter. Scutes small in size, rather few in number, weakly armed, distinct along whole length of straight portion of lateral line. Breast as broadly naked as in *C. malabaricus*. None of rays in soft dorsal and in anal produced into a filament. Lobe of soft dorsal lower than both half of base of fin, and lobe of anal, 1.57 times of spinous dorsal, 1.63 in head, 2.6 in depth of body. Caudal lobe 3.5 in length of body. Pectoral slightly longer than head; ventral 2.57 in head. Coloration just like that of *C. malabaricus*.

The above description is based upon a specimen from Uwajima, Carnegie Museum Cat. of Fishes, No. 7726, measuring 105 mm. in the length of body.

The species dealt with here quite agrees with the original description of this species given by Rüppell.

The species closely resembles *C. malabaricus*, but can be easily distinguished from that species by its having the soft dorsal lower than half both of the base of the fin and the lobe of the anal. Specimens from Formosa described and figured by Jordan and Snyder as *C. formosanus* would be this species, since the original description and the figure given by these authors quite agree with its distinctive characters.

The species seems to be widely distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is rarely known from the southernmost coasts of Japan proper.

Localities.:—Uwajima; Formosa.

27. *Caranx* (*Citula*) *chrysophrys* Cuvier and Valenciennes.

(PL. XXIV, fig. 1.)

Caranx chrysophrys Cuvier and Valenciennes, Vol. IX, 1833, p. 77, pl. 247.

Caranx nigrescens Day, Fishes of India, 1867, p. 704, pl. 1, fig. 6.

Caranx armatus Jordan and Evermann, (*non* Forskål), Proc. U. S. Nat. Mus., Vol. XXV, 1903, p. 338.

Caranx malabaricus Seno, (*partim*), (form with nineteen rays in soft dorsal), Report on Fishery Industry of Formosa, 1910, pl. VII, fig. 2.

D. VIII-I, 19 or 20; A. II-I, 16; scutes 25.

Head 3.18 in length of body (3.88 in total length); depth 2.04 (2.48); pectoral 2.4; eye 5.07 in head; snout 2.84.

Body high; nape less elevated. Dorsal profile curving down rather strongly and evenly from origin of soft dorsal to tip of snout. Snout much longer than eye, 1.75 times of latter; lower jaw slightly longer than upper; maxillary extending to front border of eye. Lateral line moderately arched, becoming straight below thirteenth soft dorsal ray, which is at posterior third of fin; curved portion much longer than straight portion, 1.84 times of latter. Scutes small, rather few in number, weakly armed, present along whole length of straight portion of lateral line. Breast as broadly naked as in *C. malabaricus*. No rays of soft dorsal and anal produced into a long filament; lobe of former 1.66 in base of fin, equal to that of latter, about two times of spinous dorsal, half of depth of body, 1.29 in head; caudal lobe 3.36 in length of body. Pectoral much longer than head, 1.3 times of it; ventral 2.7 in head.

Color in formalin dark brown above, lighter below; fins light; opercular spot brown, not distinct.

The above description is made from a specimen from Formosa, measuring 220 mm. in length of body.

The specimen now preserved in the museum of Suisan-Kōshūjo had been identified by Jordan and Evermann as *C. armatus*. There is no doubt, however, about the identity of the specimen with *C. chrysophrys* Cuvier and Valenciennes, for it agrees exactly with the original description of the species, whereas it manifestly contradicts that of *C. armatus* by Forskål.

The species resembles *C. malabaricus* and *C. cæruleopinnatus*, but differs from them in having the nape much less elevated, the snout much longer than eye; the pectoral much longer than head; and in the smaller number of the dorsal and anal rays. One of the specimens identified with *C. malabaricus* by Seno, which has nineteen soft dorsal rays and sixteen anal rays, is the present species, as can be learned from the figure given by the same author. The species proposed by Day as *C. nigrescens* seems to be also the present species, for the original description of the former species exactly agrees with that of the latter, except as to the dentition of the tongue.

The species is distributed throughout the Indian Ocean, and the tropical seas of the Pacific. It is not known from Japan proper.¹⁰

Locality.—Formosa.

¹⁰No specimens of this species were sent to the Carnegie Museum, and up to date it is not represented in our collections. W. J. HOLLAND.

28. **Caranx (Citula) hemigymnostethus** (Bleeker).

(PL. XXIV, fig. 2.)

Carangoides hemigymnostethus Bleeker, Makr., 1851, p. 364.*Caranx* sp. Seno. Report on Fishery Industry of Formosa, 1910, pl. VI, fig. 2.

D. VIII-I, 31; A. 9-I, 26; scutes 25.

Head 3.65 in length of body (4.5 in total length); depth 2.33 (2.86); pectoral 2.43; eye 3.9 in head; snout 3.1.

Body rather high; nape rather less elevated. Snout obtuse, longer than eye, 1.58 times of it; lower jaw nearly equal to upper; maxillary extending beyond front border of eye. Lateral line a little arched, becoming straight below twentieth soft dorsal ray; curved portion longer than straight portion, 1.5 times of latter. Scutes rather small in size, rather less in number, only present on posterior three-fourths of straight portion of lateral line, but moderately armed. Caudal peduncle with seven scutes. Breast only naked inferiorly. No rays in soft dorsal and anal produced. Lobe of soft dorsal 1.63 in base of fin, a little more than that of anal, 4.5 times of height of spinous dorsal, 1.63 in depth of body, 1.07 in head; caudal lobe 2.75 in length of body. Pectoral much longer than head, 1.5 times of it; ventral 2.18 in head. Free anal spines rudimentary, hidden under skin in adult.

Color in formalin brown; top of soft dorsal and of anal black, posterior margin of caudal edged with black; paired fins light; opercular spot black, distinct; axils brown.

The above description is drawn from a specimen from Ryūkyū, Carnegie Museum Cat. of Fishes, No. 7727, measuring 212 mm. in length of body.

The specimen dealt with here exactly agrees with the original description of this species given by Bleeker.

A specimen from Formosa figured by Seno as *Caranx* sp. must be this species, as is clearly shown by his figure.

The species is tropical, inhabiting the Indian Ocean and the Pacific, but is very rarely known from the warmer parts of Japan proper.

Localities.—Misaki; Ryūkyū; Formosa.

Subgenus **CARANX**.¹¹*(Tricropterus* Rafinesque).

Body oblong. Teeth on upper jaw in a narrow band, with an outer series of stronger teeth; those of lower in a single series, intermixed with larger ones. Lower jaw longer than upper. Posterior adipose eyelid developed. Breast scaly, or naked inferiorly, with a

¹¹As commonly restricted, the type being either *C. carangus* or *C. ruber*. D. S. JORDAN.

small patch of minute scales in front of ventrals. Scutes well armed, present along whole length of straight portion of lateral line. Anterior part of soft dorsal and of anal falcate; none of their rays produced into a filament.

This subgenus includes those species of *Caranx* which correspond in dentition with *C. hippos* Linnæus, the type (as *Caranx carangus*) of the genus *Tricropterus* of Rafinesque.

Eleven species of this subgenus are known from Japan. They are distinguished from one another as follows:

- a. Breast entirely scaled.
 - b. Lobe of soft dorsal and of anal lower than length of head.
 - c. Soft anal rays 16 or 17; snout not much longer than eye.
 - d. Lateral line becoming straight below sixth soft dorsal ray; snout longer than eye; body distinctly crossed with six black bands in young stage.....*sexfasciatus*.
 - dd. Lateral line becoming straight below third soft dorsal ray.
 - e. Scutes 33; soft dorsal rays 21.....*xanthopygus*.
 - ee. Scutes 30; soft dorsal rays 20.
 - f. Pectoral longer than head; lateral line moderately curved; anal rays 16; soft dorsal without black; a small blackish spot above gill-opening.....*lessoni*.
 - ff. Pectoral equal to head; lateral line strongly curved; anal rays 17; soft dorsal with blackish top and edge; no spot above gill-opening.....*oshimai*, sp. nov.
 - cc. Soft anal rays 19; scutes 38; snout much longer than eye.
 - g. Lobe of soft dorsal and of anal rather low and rather less acute; former lower than half of its base.*bixanthop erus*.
 - gg. Lobe of soft dorsal and of anal high and comparatively acute; former lower than half of its base.....*melampygus*.
 - bb. Lobe of soft dorsal and of anal not lower than length of head; soft dorsal rays 22; anal rays 18; scutes 30; color blackish.....*ishikawai*, sp. nov.

- aa.* Breast naked inferiorly, with a small patch of minute scales in front of ventrals.
- h.* Scutes 30; soft dorsal rays 18 to 20; anal rays 15 to 17.
- i.* Pectoral longer than head; maxillary extending beyond centre of eye.
- j.* Soft dorsal rays 20; anal rays 16 or 17; curved portion of lateral line nearly equal to straight portion; eye nearly equal to snout; maxillary extending beyond centre of eye; but not reaching posterior border of pupil; height of soft dorsal half of base of fin.....*ignobilis.*
- jj.* Soft dorsal rays 18 or 19; anal rays 15 or 16; curved portion of lateral line shorter than straight portion; eye shorter than snout; maxillary extending beyond posterior border of pupil; height of soft dorsal more than half of base of fin.....*bucculentus.*
- ii.* Pectoral equal to head; maxillary scarcely reaching centre of eye.....*jarra.*
- hh.* Scutes 36; soft dorsal rays 21 to 23; anal rays 16 to 18.....*sansun.*

29. ***Caranx sexfasciatus*** Quoy and Gaimard.

(Pl. XXV, figs. 3 and 4.)

Caranx sexfasciatus Quoy and Gaimard, Voy. Uranie, Poiss., 1824, p. 358, pl. 65, f. 4.—Cuvier and Valenciennes, Vol. IX, 1833, p. 112.—Jordan and Evermann, Proc. U. S. Nat. Mus., Vol. XXV, 1903, p. 337.

Caranx forsteri Cuvier and Valenciennes, Vol. IX, 1833, p. 105.—Jordan and Richards, Mem. Carnegie Mus., Vol. IV, 1909, p. 179.

Caranx flavo-ceruleus Temminck and Schlegel, 1845, p. 110, pl. 59, fig. 2.

Caranx hippos Günther, (*non* Linnæus), Cat. Fish. Brit. Mus., Vol. II, 1866, p. 449.

D. VIII-I, 20 or 21; A. II-I, 16 or 17; scutes 30.

Head 3.3 in length of body (4 in total length); depth 2.72 (3.34); pectoral 3; eye 4.63 in head; snout 3.4.

Body oblong; nape rather elevated (more so in younger stages); dorsal profile gradually and almost evenly curved from tip of snout to origin of soft dorsal, and thence descending equally with ventral profile to posterior end of fin; ventral profile curving from tip of mandible to base of ventral, and thence descending to origin of anal very slowly and almost in a straight line. Snout rather pointed, longer than eye, 1.35 times of it; maxillary extending to, or beyond, posterior border of pupil. Lateral line rather strongly arched, becoming straight below sixth soft dorsal ray (fourth or fifth in younger stages); curved portion of lateral line shorter than straight portion, 1.35 in latter. Caudal peduncle with four scutes. Breast scaly. Lobe of soft dorsal 1.65 in head, and half both of depth of body and base of fin; pectoral a little longer than head.

Color in formalin brown above, lighter below; spinous dorsal brown; soft dorsal gray, with blackish top and margin; caudal gray, edged posteriorly with black; anal and paired fins light; no opercular spot; a small black spot present above gill-opening. In rather smaller specimens, body conspicuously marked with seven black cross bands; of which the first descends through eye from occipital.

The above description is based upon a specimen from Kii, Carnegie Museum, Cat. of Fishes, No. 7728, measuring 166 mm. in length of body. The proportions of the different parts of the body vary in accordance with the size of the specimens as follows:

Length of body.....	166 mm.	129 mm.	125 mm.	113 mm.	51 mm.
Head in total length....	4.00 times	4.05 times	4.10 times	3.97 times	3.64 times
Head in length of body.	3.30 times	3.30 times	3.30 times	3.30 times	3.00 times
Depth in total length...	3.34 times	3.30 times	3.32 times	3.14 times	3.10 times
Depth in length of body.	2.72 times	2.70 times	2.63 times	2.63 times	2.55 times
Depth at nape in length					
of body.....	3.04 times	2.93 times	2.90 times	2.82 times	2.68 times
Eye in head.....	4.63 times	4.33 times	4.31 times	4.25 times	3.4 times
Snout in head.....	3.40 times	3.54 times	3.57 times	3.77 times	3.77 times
Curved portion of lateral					
line in straight portion	1.35 times	1.45 times	1.48 times	1.50 times	1.57 times

In most cases, the number of the rays in the dorsal is 20, and the number in the anal 17, but some have 20 dorsal rays and 16 anal rays, while others have 21 dorsal rays and 17 anal rays, as in the specimen figured.

Among the specimens dealt with here, the older ones exactly agree with the original description of *Caranx forsteri*, given by Cuvier and Valenciennes, and with that of *Caranx flavo-cæruleus* and its figure given by Temminck and Schlegel, while, on the other hand, the younger ones quite accord with the description of the type of *Caranx*

sexfasciatus Quoy and Gaimard, given by Cuvier and Valenciennes. These younger specimens are not only marked with black bands in the way peculiar to *C. sexfasciatus*, but when compared with the older ones, as may be seen from the above table, also have the body rather higher, the nape rather more elevated, and the lateral line curving rather more anteriorly. These facts justify the writer, in accordance with the rules of priority to apply to the present species the specific name of Quoy and Gaimard. Günther has united with this species such forms as *C. flavo-cæruleus*, *C. lessoni*, *C. personi*, etc., and regarded them as a single species synonymous with his *C. hippos*, which is not that of Linnæus, but *C. latus* of Agassiz. As stated above, the writer holds with Günther in uniting the present species with *C. forsteri* and *C. flavo-cæruleus*, but it is not justifiable to unite it with *C. latus* Agassiz, from which it differs in the number of the soft dorsal rays, the number of the scutes, the proportion of the depth of the body in its length, and the position of the arch of the lateral line, *C. latus* having twenty-two soft dorsal rays, thirty-five scutes, the depth 3 in the total length, the lobe of the soft dorsal 3 in the depth, and the lateral line becoming straight below the third soft dorsal ray. It is also distinct from *C. lessoni*, as will be explained under the description of that species. Specimens hitherto reported from Japan proper as *C. hippos* by some authors, such as Steindachner and Döderlein, Franz, etc., appear also to be this species.

The species is widely distributed throughout the Indian Ocean and the warm seas of the Pacific. It is also one of the commonest species of *Caranx* in the warmer parts of Japan proper.

Localities:—Tōkyō Bay; Kii; Uwajima; Ryūkyū; Bonin Islands; Formosa.

30. *Caranx xanthopygus* Cuvier and Valenciennes.

(PL. XXIV, fig. 3.)

Caranx xanthopygus Cuvier and Valenciennes, Vol. IX, 1833, p. 109.

? *Caranx rhabdotus* Jenkins, Bull. U. S. Fish Comm., Vol. XXII, 1903, p. 444, fig. 16.

D. VIII-I, 21 or 22; A. II-I, 17 or 18; scutes 34.

Head 3.25 in length of body (4 in total length); depth 2.66 (3.4); pectoral 3; eye 3.7 in head; snout 3.82.

Shape of body like that of *Caranx sexfasciatus*, but nape rather more elevated, and dorsal profile of head descending rather more rapidly from occipital to tip of snout. Snout rather obtuse, equal to, or slightly longer, than eye (only a little so, even in full grown

specimens); maxillary extending to posterior border of pupil. Teeth on both jaws much stronger and more unequal than in *Caranx sexfasciatus*. Lateral line strongly arched, becoming straight below third soft dorsal ray; curved portion shorter than straight portion, 1.5 in latter. Caudal peduncle with four scutes. Breast scaly. Lobe of soft dorsal equal to half both of base of fin and of depth of body, 1.5 in head; pectoral a little longer than head.

Color in formalin brown above, lighter below, very faintly banded in young stages; spinous dorsal brown; soft dorsal gray, its top and edge washed with black; caudal gray, edged with blackish posteriorly, its upper lobe darker than the lower; anal and paired fins light; opercular spot absent; a small black spot above gill-opening. In life, dorsals and upper lobe of caudal greenish yellow; other fins yellow.

The above description is founded upon a specimen from Ryūkyū, Carnegie Museum Cat. of Fishes, No. 7729, measuring 160 mm. in length of body. The proportions of the depth in the length, and of the eye and of the snout in the head vary as follows:

Length of body.....	220 mm.	185 mm.	160 mm.	129 mm.
Depth at middle in length of body.....	2.84 times	2.72 times	2.66 times	2.63 times
Depth at nape in length of body.....	2.82 times	2.93 times	2.96 times	2.80 times
Eye in head.....	4.28 times	4.00 times	3.70 times	3.63 times
Snout in head.....	3.58 times	3.60 times	3.82 times	4.00 times

In most cases the number of soft dorsal rays is twenty-one, and that of anal rays seventeen, but two out of thirty individuals observed by the writer have twenty-two dorsal rays and seventeen anal rays, while one has twenty dorsal rays and eighteen anal rays.

The specimens examined agree with the original description of the type of this species by Cuvier and Valenciennes, the only difference being that in all the specimens observed by the writer, the brown spots on the back and sides, which the author mentions as occurring in the type, are wanting, just as they are wanting in their cotype.

The present species closely resembles *C. sem* Cuvier and Valenciennes, only differing from this in the number of the soft dorsal rays, which is nineteen in *C. sem*. It also comes near to *C. sexfasciatus*, from which it can be distinguished by having the eye decidedly larger in relation to the snout, and the lateral line curving more in front and more strongly. A specimen from Hawaii, described and figured by Jenkins as a new species under the name *C. rhabdotus*, and which is

considered by most American ichthyologists as a synonym of *C. sexfasciatus*, much resembles the present species,¹² since as may be known from the figure given by the same author, it has the eye almost as large as the snout and the lateral line curving more anteriorly and more strongly than in *C. sexfasciatus*. On the other hand, specimens described by Bleeker as *C. xanthopygus* do not belong to the present species, as, according to his description, the breast should be naked.

The species is distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is occasionally known from the southernmost coasts of Japan proper.

Localities:—Tosa; Ryūkyū; Formosa.

31. *Caranx lessoni* Cuvier and Valenciennes.

(PL. XXV, fig. 2.)

Caranx lessoni Cuvier and Valenciennes, Vol. IX, 1833, p. 113.

Caranx hippos Günther (*non* Linnæus), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 449.

D. VIII-I, 20; A. II-I, 16; scutes 30.

Head 3.28 in length of body (4 in total length); depth 2.56 (3.12); pectoral 3.06; eye 3.9 in head; snout 3.3.

Shape of body like that of *C. sexfasciatus*. Snout rather pointed, a little longer than eye; maxillary somewhat extending beyond posterior border of pupil. Teeth on jaw rather stronger and more unequal than those of *C. sexfasciatus*. Lateral line rather strongly arched, becoming straight below third soft dorsal ray; curved portion shorter than straight portion, 1.45 in latter. Caudal peduncle with four scutes. Breast scaly. Lobe of soft dorsal 2.1 in base of fin, 1.72 in head, 2.2 in depth of body; pectoral rather longer than head.

Color in formalin brownish; dorsal and caudal light; anal and paired fins pale; opercular spot absent; a small brown spot above gill-opening. In life all fins yellow.

The above description is based upon a specimen from Formosa, Carnegie Museum Cat. of Fishes, No. 7730, measuring 140 mm. in length of body.

The specimen dealt with here quite agrees with the original description of this species given by Cuvier and Valenciennes.

The species closely resembles *C. sexfasciatus*, but differs from it in having a rather higher body, a rather larger eye, rather stronger

¹²The dark bands are, however, more persistent, and the species invades fresh waters. D. S. JORDAN.

teeth on jaws, the lateral line becoming straight below the third dorsal ray, the soft dorsal and the caudal nearly clear of black, and the body not crossed with dark bands even in the youngest stages. A form described by Bleeker as *C. lessoni* does not belong to the present species, since, according to his description, the breast should be naked.

The species is distributed throughout the Indian Ocean, and the tropical seas of the Pacific. It is not known from Japan proper.

Locality:—Formosa.

32. *Caranx oshimai* Wakiya, sp. nov.

(PL. XXVII, fig. 1.)

Caranx jarra Cuvier and Valenciennes, Vol. IX, 1833, p. 109, (*partim*).

D. VIII-I, 20; A. II-I, 17; scutes 31.

Head 3.32 in length of body (4 in total length); depth 2.5 (3); pectoral 3.32; eye 4.11 in head; snout 3.36.

Shape of body like that of *Caranx sexfasciatus*, but body rather higher at middle and rather less elevated at nape, and outline of belly more strongly curved. Snout rather pointed, a little longer than eye, 1.22 times of it; maxillary extending to posterior border of pupil. Teeth on jaws as strong as those of *C. sexfasciatus*, but more unequal. Lateral line strongly arched, becoming straight below third soft dorsal ray; curved portion shorter than straight portion, 1.57 in latter. Caudal peduncle with four scutes. Breast scaly. Lobe of soft dorsal slightly lower than half of base of fin, 1.6 in head, 2.27 in depth of body; pectoral equal to head.

Color in formalin brownish, becoming very slightly darker toward back; spinous dorsal gray, with blackish spines; soft dorsal light, with blackish top and margin; caudal light, becoming slightly darker distally; paired fins pale; opercle quite clear of black.

The above description is based upon the type, a specimen from Formosa, Carnegie Museum Cat. of Fishes, No. 7731, measuring 123 mm. in length of body.

The specimen dealt with here is identical with that hesitatingly named *C. jarra* by Cuvier and Valenciennes. Cuvier and Valenciennes based their species upon Russell's figure of "Yarradenree-Parah." The description given by Cuvier and Valenciennes and the specimen before the writer distinctly differ from Russell's figure in the number of rays in the soft dorsal and the anal, and in the color of the fins.

The species resembles *C. sexfasciatus* and *C. lessoni*, but is distinct from both in having a rather less elevated nape, a more ventricose belly, a more strongly curved lateral line, a shorter pectoral, and no dark spot above the gill-opening. From *C. sexfasciatus* it differs decidedly in having the teeth on the jaws rather more unequal, a rather larger eye, the lateral line more curved anteriorly, and the body not crossed with dark bands even in the young stages. From *C. lessoni* it differs in having weaker teeth on the jaws and the soft dorsal tipped and edged with blackish.

The species is distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is not known from Japan proper.

Locality.—Formosa.

The species is named after Dr. M. Oshima of the Central Research Institute of Formosa.

33. *Caranx bixanthopterus* Rüppell.

(PL. XXVII, fig. 2.)

Caranx bixanthopterus Rüppell, N. W. Fishes, 1835, p. 49, pl. 14, fig. 2.

Caranx latus Jenkins (*non* Agassiz), Bull. U. S. Fish. Comm., Vol. XXII, 1903, p. 444.

Caranx forsteri Jordan and Evermann (*non* Cuvier and Valenciennes), Bull. U. S. Fish. Comm., Vol. XXIII, 1905, p. 191.

D. VIII-I, 23; A. II-I, 19; scutes 38.

Head 3.34 in length of body (4.05 in total length); depth 2.5 (3.04); pectoral 3; eye 5 in head; snout 2.9.

Shape like that of *Caranx sexfasciatus*, but nape less elevated, and outline between origin of soft dorsal and tip of snout more evenly curving, so that it forms a quite regular arc of a circle. Snout pointed, much longer than eye, nearly 1.75 times of it; maxillary scarcely reaching centre of eye. Teeth on jaws finer than those of *C. sexfasciatus*. Width of interorbital space rather more than diameter of eye. Lateral line rather strongly curved, becoming straight below fifth soft dorsal ray; curved portion shorter than straight portion, 1.4 in latter. A few anterior scutes much smaller than others. Caudal peduncle with five scutes. Breast scaly. Lobe of soft dorsal 2.16 in base of fin, 1.55 in head, 2.2 in depth of body; pectoral longer than head, 1.2 times of it.

Color in formalin brown above, lighter below; spinous dorsal brown; soft dorsal and anal gray, with blackish tip and edge; caudal brown, edged with blackish; paired fins light; opercular spot absent; no black spot above gill-opening.

The above description is founded upon a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7732, measuring 135 mm. in length of body.

All the specimens so far examined quite agree with the original description and the figure of this species given by Rüppell.

The species distinctly differs from all other Japanese forms, having the breast scaly; besides it has a longer snout, much more numerous scutes and anal rays, and the anal tipped with black. However, the species agrees so closely with *C. stellatus* (*melampygus* of authors, not of Cuvier and Valenciennes) in the above mentioned characters, that Jordan and Evermann in their great work on "The Fishes of North and Middle America," have treated *C. bixanthopterus* as a synonym of the latter, which none the less differs from the former in having the soft dorsal and the anal with much higher and acuter lobes, the interorbital space rather less than the diameter of the eye, brown spots scattered over the body, and a small, but distinct, opercular spot.

Specimens from Hawaii identified by Fowler, Snyder, and Jenkins with *C. latus* and described by Jordan and Evermann as *C. forsteri*, should belong to this species, for, according to the description of the last named authors, their specimen has the head 3.3 in the length of body, the depth 2.5, the eye 5.5 in the head, the snout 3.5, the produced portion of the anal as dark as that of the soft dorsal, 23 soft dorsal rays, 19 anal rays, and 36 scutes. These facts also lead the writer to believe that *C. latus* reported by Jordan and Snyder from Tōkyō Bay, and *C. forsteri* hitherto reported from Japan by most American ichthyologists, except Jordan and Richardson (who give *C. sexfasciatus*, as it has been identified by Jordan and Evermann) also would probably be this species.¹³

The species seems to be distributed as widely as *Caranx sexfasciatus*, but it is rather rare in the seas of Japan proper. It is one of the chief food-fishes of the South Seas. Known generally as *Ulua*.

Localities:—Kii; Uwajima; Nagasaki; Bonin Islands; Ryūkyū.

¹³Mr. Wakiya is no doubt correct in this statement. It is also probable that the original *Caranx forsteri* is not this species, as it has twenty dorsal and sixteen anal rays, as in *C. sexfasciatus* and *C. heberi*. *Caranx bixanthopterus* may be the oldest name for this species, but the original account of *C. melampygus* fits it better than it does the species usually called by that name. D. S. JORDAN.

34. *Caranx melampygus* Cuvier and Valenciennes.

Caranx melampygus Cuvier and Valenciennes, Vol. IX, 1833, p. 116.—Günther, Cat. Fish. Brit. Mus., Vol. II, 1860, p. 400.

D. VIII-I, 23; A. II-I, 19; scutes 38.

Head 3.33 in length of body (4.07 in total length); depth 2.68 (3.28); pectoral 2.81; eye 4.9 in head; snout 2.7.

Nape elevated; dorsal profile descending rapidly from occipital to tip of snout, nearly straight. Snout pointed, much longer than eye, 1.8 times of the same, maxillary scarcely reaching center of eye. Width of interorbital space much more than eye, 1.5 times of the same. Lateral line moderately curved, becoming straight below sixth soft dorsal ray, which is at anterior fifth; curved portion rather shorter than straight portion, 1.23 in latter. A few anterior scutes much smaller than others. Caudal peduncle with five scutes. Breast scaly. Lobes of soft dorsal and anal high and acute; former 1.71 in base of fin and in depth of body, 1.38 in head.

Color in formalin almost uniformly dark brown, not spotted with black; all vertical fins blackish; anal becoming darker distally, so that the first ray and tips of fins become black; paired fins light.

The above description is based upon a specimen from Ryūkyū, Carnegie Museum Cat. of Fishes, No. 7733, measuring 180 mm. in length of body.

The specimen dealt with here exactly agrees with the original description of this species given by Cuvier and Valenciennes.

The present species well accords with *C. xanthopterus* and with *C. stellatus* (= *melampygus* of authors, not of Cuvier and Valenciennes) in the formulæ of the soft dorsal and of the anal rays, the number of scutes, the proportion of the eye in the snout, and in having a black tip to the anal. However, it can be distinguished from the former in having the lobe of the soft dorsal and the anal much higher and acuter, the nape much more elevated, the interorbital space broader, compared with the eye, and a darker body. From *C. stellatus* it may be discriminated by its having the interorbital space narrower, the maxillaries extending beyond the front border of the pupil. and the body not spotted with black.

The species is distributed throughout the tropical seas of the Pacific, and the Indian Ocean. It is not known from Japan proper.

Locality.—Ryūkyū.

35. ***Caranx ishikawai* Wakiya sp. nov.**

(PL. XXVI.)

D. VIII-I, 22; A. II-I, 18; scutes 30.

Head 3.6 in length of body (4.33 in total length); depth 2.3 (3.22); pectoral 2.38 (3.33); eye 5 in head; snout 3.

Body high, elevated at nape, dorsal profile of head descending rapidly and nearly straight, with a concavity above anterior nostril. Snout obtuse, longer than eye; maxillary extending somewhat beyond front border of pupil. Lateral line strongly arched, becoming straight below third soft ray; curved portion shorter than straight portion, 1.5 in latter. Caudal peduncle with four scutes. Breast scaly. All parts of gill-cover scaled, leaving a tolerably broad naked area along the free margin of interopercle and subopercle. Falcated portion of dorsal and of anal very high; former about one diameter of eye longer than length of head, and latter about equal to head. Pectoral long, 1.3 times of head, but 3.33 in total length of body. Caudal lobe 4.2 in total length.

Color in formalin uniformly blackish brown.

The above description is based upon the type, a specimen from the Bonin Islands, Carnegie Museum Cat. of Fishes, No. 7734, measuring 323 mm. in the length of body.

The species is one of the largest of the genus in Japan, one specimen at hand attaining 405 mm. in length of body.

It closely resembles *C. lugubris* Poey, but is distinct from this in having a higher body, much higher dorsal and anal lobes, and rather shorter pectoral and caudal lobes. A specimen from Formosa which is described by Jordan and Evermann as "a small specimen from Kotosho resembling *Carangus jarra* (Cuvier and Valenciennes). D. VIII-I, 23; scales about 30; no spots," would probably be a young example of this species.

It is not known from Japan proper.

Localities.:—Bonin Islands; Formosa.

The species is named after Prof. Chiyomatsu Ishikawa.

36. ***Caranx ignobilis* (Forskål).**

(PL. XXVII, fig. 3.)

Scomber ignobilis, Forskål, 1775, p. 55.*Caranx hippoides* Jenkins, Bull. U. S. Fish. Comm., Vol. XXII, 1903, p. 443.

D. VIII-I, 20; A. II-I, 16 or 17; scutes 30.

Head 3.21 in length of body (3.88 in total length); depth 2.21 (2.67); pectoral 2.8; eye 3.5 in head; snout 3.15.

Body high; nape elevated; height of head equal to its length. Snout obtuse, only a little longer than eye; maxillary extending somewhat beyond centre of eye. Teeth on jaws strong and unequal. Lateral line moderately arched, becoming straight below seventh soft dorsal ray; curved portion somewhat wavy, nearly equal to straight portion, 1.12 in latter. Caudal peduncle with four scutes. Breast naked below, with a small patch of minute scales in front of ventrals. Lobe of soft dorsal half of base of fin, 1.65 in head, 2.3 in depth of body; pectoral a little longer than head, 1.15 times of it.

Color in formalin brownish above, lighter below; fins light, except spinous dorsal, which is brown; top and edge of soft dorsal blackish, and upper lobe of caudal slightly darker than lower; opercular spot indistinct; no spot above gill-opening.

The above description is made from a specimen from Nagasaki, measuring 106 mm. in length of body. The figured specimen, Carnegie Museum Cat. of Fishes, No. 7735, measures 147 mm. to caudal.

The proportions of the parts of the body vary in accordance with the size of the specimens as follows:

Length of body.....	142 mm.	106 mm.	79 mm.
Eye in head.....	3.90 times	3.68 times	3.37 times
Snout in head.....	3.30 times	3.33 times	3.50 times
Curved portion of lateral line in straight portion.....	1.12 times	1.16 times	1.15 times
Height of soft dorsal in base.....	2.03 times	2.00 times	2.00 times

The specimens dealt with here fully agree with the original description of this species given by Forskål, and well agree with that given by Jenkins of *C. hippoides*, which is considered by Jordan and other American ichthyologists as being a synonym for the present species. It ought to be remembered, however, that the specimen described by Jenkins evidently differs from that represented on our plate in the size of the eye in comparison with the snout, the position of the point at which the lateral line bends, and in the extension of the maxillary. These may be matters of age.

The species also closely resembles *Caranx hippos* of the Atlantic, but differs from it in having a rather higher body, a rather longer head, a larger eye, a longer pectoral, and no distinct opercular spot.

The species is distributed throughout the Indian Ocean and the warm seas of the Pacific. It is also known from the southern coasts of Japan proper.

Localities.—Nagasaki; Uwajima; Ryūkyū; Formosa.

37. *Caranx bucculentus* Alleyne and Macleay.

(PL. XXVII, figs. 4 and 5.)

Caranx bucculentus Alleyne and Macleay, Proc. Linn. Soc. N. S. Wales, Vol. I, 1876, p. 326, pl. XI, fig. 1.

D. VIII-I, 18 or 19; A. II-I, 15 or 16; scutes 30.

Head 3 in length of body (3.96 in total length); depth 2.28 (2.83); pectoral 2.8; eye 4.72 in head; snout 2.88.

Shape of body like that of *C. ignobilis*, but nape more elevated. Snout obtuse, longer than eye, 1.63 times in it; maxillary extending beyond posterior border of pupil. Teeth on jaws rather weaker and less unequal than in *C. ignobilis*. Lateral line strongly arched, becoming straight below fifth soft dorsal ray; curved portion shorter than straight portion, 1.3 in latter. Caudal peduncle with four scutes. Breast naked below, with a small patch of minute scales in front of ventrals. Lobe of soft dorsal 1.71 in base of fin, 1.5 in head, 2.12 in depth of body. Pectoral rather longer than head, 1.07 times of it.

Color in formalin brownish above, light below; spinous dorsal brown; soft dorsal gray, with blackish first ray and edge; caudal gray, its upper caudal lobe darker than lower; anal and paired fins light; opercular spot absent; no spot above gill-opening.

The above description is drawn from a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7736, measuring 170 mm. in length of body.

The measurements of another specimen from Formosa, 130 mm. in length of body, are as follows: eye 4.1 in head; snout 3.03; curved portion of lateral line 1.37 in straight portion; height of soft dorsal 1.8 in base of fin.

The specimens thus far examined quite agree with the original description of this species given by Alleyne and Macleay, except that the lateral line becomes straight below the fifth soft dorsal ray, instead of the fifth dorsal spine, as stated by the authors. However, since any form having such an abruptly curved lateral line never occurs in the genus *Caranx*, the writer has identified them with Alleyne and Macleay's species on the assumption that their statement about the lateral line is not correct.

They also well agree with the figure of *C. hippoides* given by Jenkins.

The present species closely resembles *C. ignobilis*, but differs from it in having rather less numerous dorsal and anal rays, a smaller

eye, a rather more strongly and shorter curved lateral line, and a higher soft dorsal. Specimens identified by Bleeker with *C. sem* would be the present species.

The species seems to be widely distributed throughout the Indian Ocean and the warm seas of the Pacific. It occurs rather commonly in the warmer seas of Japan proper.

Localities.—Tōkyō Bay; Kii; Formosa.

38. *Caranx jarra* Cuvier and Valenciennes.

(PL. XXIX, fig. 2.)

Caranx jarra Cuvier and Valenciennes, Vol. IX, 1833, p. 109 (based on Russell's figure of Yarradanree-Parah).

D. VIII-I, 19 or 20; A. II-I, 16; scutes 30.

Head 3 in length of body (3.6 in total length); depth 2.45 (3); pectoral 3; eye 4 in head; snout 3.2.

Shape of body like that of *C. ignobilis*. Snout rather obtuse, longer than eye, 1.25 times in it; maxillary scarcely extending to center of eye. Teeth on jaws as strong and unequal as those of *C. ignobilis*. Lateral line moderately arched, becoming straight below the sixth soft dorsal ray; curved portion running somewhat wavy, only a little shorter than straight portion, 1.2 in it. Caudal peduncle with four scutes. Breast narrowly naked below, with a small patch of minute scales in front of ventrals. Lobe of soft dorsal 2 in base of fin, 1.76 in head, 2.47 in depth of body; pectoral equal to head.

Color like that of *C. ignobilis*.

The above description is drawn from a specimen from the Bonin Islands, Carnegie Museum Cat. of Fishes, No. 7737, measuring 100 mm. in length of body.

All the specimens thus far examined fully accord with Russell's figure of "Yarradanree-Parah," upon which Cuvier and Valenciennes founded *C. jarra*, while they differ from a specimen doubtfully identified by these authors with the same figure of Russell, in having the breast naked inferiorly, and the soft dorsal not blackish at the tip and the edge. They also differ from the specimens identified respectively by Bleeker and by Günther with this species in having a shorter pectoral, rather less numerous dorsal and anal rays, and much less numerous scutes, and a rather higher body. On the other hand, this species closely resembles *C. ignobilis* and *C. hippoides*, but differs from them in having the maxillary scarcely reaching the

centre of the eye, and the pectoral not longer than the head, and differs especially from the former in having a smaller eye, and from the latter in having a lower soft dorsal. Specimens identified by Bleeker with *C. lessoni* would probably be this species.

The species is distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is not known from Japan proper.

Locality:—Bonin Islands.

39. *Caranx sansun* (Forskål).

(PL. XXVIII, figs. 1 and 2.)

Scomber sansun Forskål, 1775, p. 55.

Caranx jarra Bleeker, (*non* Cuvier and Valenciennes) Verh. Bat. Gen. XXIV, Makr., 1852, p. 58.—Günther (*non* Cuvier and Valenciennes) Cat. Fish. Brit. Mus., Vol. II, 1860, p. 446.—Jordan and Evermann (*non* Cuvier and Valenciennes), Proc. U. S. Nat. Mus., Vol. XXV, 1903, p. 337.

D. VIII-I, 21 to 23; A. II-I, 16 to 18; scutes 36.

Head 3.61 in length of body (4.3 in total length); depth 2.8 (3.5); pectoral 2.86; eye 5 in head; snout 3.25.

Nape much less elevated than usual; head lower than its length, and profile not greatly curved. Snout obtuse, longer than eye, 1.54 times of it; maxillary scarcely extending to centre of eye. Lateral line moderately arched, becoming straight below fifth dorsal ray; curved portion somewhat wavy, shorter than straight portion, 1.3 in latter. Caudal peduncle with four scutes. Breast only naked at bottom, with a small patch of minute scales in front of ventrals. Lobe of soft dorsal 1.55 in base of fin, 1.2 in head, 1.5 in depth of body. Pectoral much longer than head, 1.26 times of it.

Color in formalin brown above, lighter below; dorsals and caudal gray; top and edge of soft dorsal blackish; caudal edged with blackish posteriorly, its upper lobe darker than lower, anal and paired fins light; opercular spot indistinct; no spot above gill-opening; axils brownish.

The above description is made from a specimen from Ryūkyū, Carnegie Museum Cat. of Fishes, No. 7738, measuring 224 mm. in length of body.

The number of soft anal rays varies from sixteen to eighteen.

The specimens dealt with here are identical with those described by Bleeker and others as *C. jarra*, and, in having the breast naked with a patch of minute scales in front of the ventrals, bear a close resemblance to all the species allied to *C. ignobilis*, such as *C. hippos*, *C. jarra*, and *C. bucculentus*. However, they differ distinctly from

all these species in having the pectoral much longer than the head, the soft dorsal much higher than half of the base of the fin, the depth of body as low as 3 in the length, the soft dorsal rays as numerous as 21 to 23, and the scutes as numerous as 36. On the other hand, the present specimens quite agree with the original description of *C. sansun* given by Forskål, which, as he states, closely approaches *C. ignobilis*, only differing from it in having twenty-two dorsal rays and sixteen anal rays, whereas the specimens hitherto identified with *C. sansun* by various authors do not accord with the original description in the number of the soft dorsal rays. In consequence the writer is inclined to apply the specific name given by Forskål to the specimens which accord with the description above given by that writer. A specimen from Formosa, identified by Jordan and Evermann and by Jordan and Richardson with *C. jarra*, certainly belongs to this species; as can be known from the note given by the former authors. Both the specimens described by Bleeker as *C. jarra* and as *C. xanthopygus* also belong to the present species, the former having twenty-two dorsal rays, and the latter twenty-one.

The species is widely distributed throughout the Indian Ocean and the warm seas of the Pacific, but it is rather rare in the waters of Japan proper.

Localities:—Ryūkyū; Kumamoto; Uwajima; Formosa.

Subgenus ATULE Jordan and Jordan.

Body oblong. Teeth on both jaws usually in a single series, but those on upper in a narrow band in some species; vomer, palatines, and tongue toothed. Snout not much longer than eye; maxillary extending to, or beyond, front border of eye; lower jaw not shorter than upper. Adipose eyelid well developed. Breast scaly. Scutes well armed, present along whole length of straight portion of lateral line. Anterior parts of soft dorsal, and of anal not falcate; none of their rays produced into a filament.

As defined above, this subgenus, which corresponds with a part of the genus *Selar*,¹⁴ can be distinguished from all other subgenera of *Caranx*. Bleeker includes in *Selar* such genera as *Trachurus* and *Trachurops*, which have the same dentition as that of *Selar*. *Trachurus*, however, differs manifestly from all the species of *Caranx* by the great development of the scutes, *Selar* (*Trachurops*) by the possession of a deeply furrowed shoulder-girdle.

Four species of this subgenus are known from Japan. They are distinguished from one another as follows:

¹⁴But the type of *Selar*, as fixed by Jordan and Gilbert, is a species of *Trachurops*.
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- a. Teeth on upper jaw in a single series; fifty or more scutes.
- b. Lateral line becoming straight below third soft dorsal ray; maxillary scarcely reaching front border of pupil; fifty-eight scutes. *djeddaba*.
- bb. Lateral line becoming straight below origin of soft dorsal; maxillary extending beyond front border of pupil; fifty scutes. *malam*.
- aa. Teeth on upper jaw in a narrow band.
- c. Depth 3.33 in body length; pectoral 3; forty-five scutes. *affinis*.
- cc. Depth 2.5 in body length; pectoral 3.5; thirty-six scutes. *miyakamii*.

40. **Caranx (Atule) djeddaba** (Forskål).

(PL. XXIX, fig. 1.)

Scomber djeddaba Forskål, 1775, p. 56.

Caranx djeddaba Seno, Report on Fishery Industry of Formosa, 1910, pl. IX, fig. 1.

D. VIII-I, 24; A. II-I, 22; scutes 58.

Head 3.95 in length of body (4.75 in total length); depth 3.1 (3.72); pectoral 4.16; eye 4 in head; snout 4.

Body rather low; profiles evenly and equally curved. Snout obtuse, equal to eye; maxillary scarcely reaching front border of pupil; lower jaw slightly longer than upper. Posterior adipose eyelid broad, extending to posterior border of pupil. Lateral line strongly arched, becoming straight below third soft dorsal ray; curved portion much shorter than straight portion, twice in latter. Scutes very numerous, distinct along whole length of straight portion of lateral line. Caudal peduncle with six scutes.

Color in formalin brown above, light below; spinous dorsal blackish; soft dorsal gray, edged with blackish; caudal gray; paired fins light; opercular spot black, distinct; free margin of branchiostegal membrane black.

The above description is drawn from a specimen from Ryūkyū, measuring 158 mm. in length of body.

The specimens examined quite agree with the original description of this species given by Forskål.

The species is widely distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is not known from Japan proper.

Localities:—Ryūkyū; Formosa.

One specimen, Carnegie Museum Cat. of Fishes, No. 7739, from Formosa.

41. **Caranx (Atule) malam** (Bleeker).

(PL. XXIX, fig. 3.)

Selar malam Bleeker, Fishes of Java, III, 1851, p. 362.

D. VIII-I, 23; A. II-I, 20; scutes 50.

Head 3.86 in length of body (4.72 in total length); depth 2.8 (3.42); pectoral 3.73; eye 3.5 in head; snout 3.5.

Profiles evenly and equally curved. Snout equal to eye; lower jaw slightly longer than upper; maxillary extending beyond front border of pupil. Posterior adipose eyelid broad, extending to posterior border of pupil. Lateral line strongly arched, becoming straight below first soft dorsal ray; curved portion much shorter than straight portion, 2.28 in latter. Scutes very numerous, distinct along whole length of straight portion of lateral line. Caudal peduncle with six scutes.

Color in formalin brownish above, light below; spinous dorsal blackish; soft dorsal and anal gray, edged with blackish; caudal gray; paired fins pale; opercular spot black, distinct.

The above description is drawn from a specimen from Formosa, Carnegie Museum Cat. of Fishes, No. 7740, measuring 112 mm. in length of body.

The specimen exactly agrees with the original description of this species given by Bleeker.

The species seems to be distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is not known from Japan proper.

Locality:—Formosa.

42. **Caranx (Atule) affinis** Rüppell.

(PL. XXX, fig. 1.)

Caranx affinis Rüppell, N. W. Fisch, 1828, p. 49, pl. 14, fig. 1.

D. VIII-I, 24; A. II-I, 21; scutes 45.

Head 3.5 in length of body (4.1 in total length); depth 3.36 (3.95); pectoral 3.05; eye 5 in head; snout 3.6.

Profiles equally and evenly curving toward both ends. Snout rather pointed, longer than eye. Lower jaw longer than upper; maxillary extending to front border of eye. Anterior and posterior adipose eyelids well developed, extending to pupil. Teeth minute, those on upper jaw in a very narrow band. Lateral line moderately curved, becoming straight below ninth soft dorsal ray, which is at anterior third of fin; curved portion equal to straight portion. Scutes

numerous, well armed, present along whole length of straight portion of lateral line. Caudal peduncle with six scutes. Pectoral long, extending to origin of soft anal.

Color in formalin brownish above, light below; opercular spot black, very distinct.

The above description is founded upon a specimen from Formosa, Carnegie Museum Cat. of Fishes, No. 7741, 244 mm. in length of body.

The specimen dealt with here exactly agrees with the original description and the figure of this species given by Rüppell.

The species is widely distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is not known from the waters of Japan proper.¹⁵

Localities:—Formosa; Ryūkyū.

43. *Caranx (Atule) miyakamii* Wakiya, sp. nov.

(Pl. XXIX, fig. 4.)

D. VIII-I, 25; A. II-I, 20; scutes 36.

Head 3.84 in length of body (4.68 in total length); depth 2.53 (3.08); pectoral 3.5; eye 3.78 in head; snout 3.87.

Ventral profile more strongly curved than dorsal profile. Snout obtuse, equal to eye; maxillary extending to front border of pupil; lower jaw rather longer than upper. Posterior adipose eyelid broad, extending to posterior border of pupil, anterior eyelid also well developed. Teeth on upper jaw arranged in a narrow band. Lateral line rather strongly arched, becoming straight below fifth soft dorsal ray; curved portion shorter than straight, 1.34 in latter. Scutes distinct along whole length of straight portion of lateral line. Caudal peduncle with six scutes. Pectoral rather short, not extending to origin of anal. Cheek narrowly scaled; all parts of gill-cover naked.

Color in formalin brownish above, light below; dorsals, anal, and caudal grayish; soft dorsal and anal edged with brown; caudal becoming darker posteriorly; paired fins pale; opercular spot black, distinct, encroaching on shoulder.

The above description is made from the type, a specimen from Formosa, Carnegie Museum Cat. of Fishes, No. 7742, measuring 119 mm. in length of body.

This species closely resembles *C. kalla* (Bleeker) in the shape of the

¹⁵The closely allied form found in Hawaii and Samoa is somewhat different, and has been named *Atule lundini*. D. S. JORDAN.

body, in the number of soft rays in the soft dorsal and of the anal, and in the coloration; but quite differs from it in having the teeth on the upper jaw in a band, not in a single series, and in having thirty-six scutes instead of forty-two. In the dentition, the species corresponds with *C. affinis*, but differs from this latter species in having a higher body, less numerous scutes, a more strongly curved lateral line and a shorter pectoral.

The species is named after Mr. K. Miyakami of the Formosan Government, who has helped the writer in collecting the carangoid fishes of Formosa.

Locality:—Formosa.

Subgenus LONGIROSTRUM¹⁶ Wakiya, **nom. nov.**

Body oblong, teeth on each jaw arranged in a single series; vomer, palatines, and tongue toothed, but vomerine teeth lost with age. Snout much longer than eye; maxillary not reaching eye; lower jaw not longer than upper. Adipose eyelid rudimentary. Breast scaly. Lateral line broadly arched. Scutes not present along whole length of straight portion of lateral line. Anterior parts of soft dorsal and of anal not falcate; none of their rays produced into a filament.

It corresponds with the subgenus *Atule* in the dentition, but differs from the same in having the snout much longer than the eye, the adipose eyelid quite rudimentary, and the scutes not developing in the anterior part of the straight portion of the lateral line.

Three species of the subgenus are known from Japan.

- a. Scutes more than twenty-five; opercular spot black, distinct; teeth on jaw rather strong.
- b. Scutes thirty; pectoral shorter than depth of body; soft dorsal rays twenty-six or twenty-seven.....*platessa*.
- bb. Scutes twenty-six; pectoral shorter than depth of body; soft dorsal rays twenty-four or twenty-five.....*delicatissimum*.
- aa. Scutes about twenty; opercular spot obscure; teeth on jaws exceedingly fine; pectoral much shorter than depth of body; soft dorsal rays twenty-six.....*mertensi*.

¹⁶The writer proposes this name as a substitute for *Selenia*, preoccupied in the Coleoptera.

44. *Caranx (Longirostrum) platessa* (Cuvier and Valenciennes).

Caranx platessa Cuvier and Valenciennes, Vol. IX, 1833, p. 84.

D. VIII-I, 26 or 27; A. II-I, 22 or 23; scutes 30.

Head 3.33 in length of body (3.9 in total length); depth 2.85 (3.35); pectoral 2.8; eye 6.8 in head; snout 2.47.

Nape elevated; dorsal profile of head almost straight, descending rather rapidly from occipital to tip of snout, showing a slight concavity above nostrils. Snout pointed, very much longer than eye, 2.9 in it; maxillary not reaching eye; lower jaw included. Teeth on jaws rather strong; vomer not toothed in full grown specimens. Lateral line becoming straight below fifteenth soft dorsal ray, which is at middle of soft dorsal; curved portion longer than straight portion, 1.6 times of latter. Scutes rather well armed, present on posterior four-fifths of straight portion of lateral line. Caudal peduncle with seven scutes. All parts of gill-cover scaled, only leaving a broad naked area on margin of interopercle. Pectoral equal to depth of body.

Color in formalin brown above, light below; opercular spot black, very distinct.

The above description is drawn from a specimen from Nagasaki, Carnegie Museum Cat. of Fishes, No. 7743, measuring 400 mm. in length of body.

The specimen examined agrees well with the original description of this species given by Cuvier and Valenciennes.

It is widely distributed throughout the Indian Ocean and the tropical seas of the Pacific, and is rarely known from the southern coasts of Japan proper.

Localities:—Nagasaki; Bonin Islands.

45. *Caranx (Longirostrum) delicatissimus* (Döderlein).

(Pl. XXVIII, fig. 3.)

Caranx delicatissimus Döderlein, Vol. III, 1884, p. 16.

D. VIII-I, 24 or 25; A. II-I, 21 or 22; scutes 26.

Head 3.25 in length of body (3.85 in total length); depth 2.86 (3.35); pectoral 3.25; eye 5.63 in head; snout 2.58.

Shape of body like that of *C. platessa*, but nape less elevated, and dorsal profile almost evenly curving from origin of soft dorsal to tip of snout. Snout pointed, very much longer than eye, 2.18 of it; maxillary not reaching front border of eye, its posterior end falling in front of eye at a distance equal to one-fourth of diameter of eye. Lower jaw rather included. Adipose eyelid rudimentary. Teeth on

jaws rather strong; vomer not toothed in adult. Lateral line becoming straight below thirteenth soft dorsal ray, which is before middle of fin; curved portion longer than straight portion, 1.5 times of latter. Scutes rather well armed, present along posterior three-fourths of straight portion of lateral line. Caudal peduncle with six scutes. All parts of gill-cover scaly, except preopercle, but free margin of interopercle and subopercle naked. Pectoral shorter than depth of body.

Color in formalin brown above, light below; opercular spot black, very distinct.

The above description is drawn from a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7744, measuring 200 mm. in the length of body. Among the specimens examined by the writer, those not reaching 130 mm. in length of body have a toothed vomer.

The specimens examined quite agree with the original description of this species given by Döderlein, except in the number of anal rays, which is given by that author as eleven. However, since no form having the anal composed of such a small number of rays ever occurs in *Caranx*, the writer makes his identification with Döderlein's species on the assumption that the statement of Döderlein as to the number of the anal rays is not correct.

The present species closely resembles *C. platessa*, but differs from it in the dorsal profile of the head, the length of the pectoral, the squamation of the gill-cover, the position of the point where the lateral line bends, and the number of scutes, and, although slightly, by that of the rays in the soft dorsal.

The species is known only from Japan proper.

Localities:—Miyako; Tōkyō Bay; Kii.

46. *Caranx (Longirostrum) mertensi* Cuvier and Valenciennes.

Caranx mertensi Cuvier and Valenciennes, Vol. IX, 1833, p. 64.

Caranx leptolepis Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 440.

D. VIII-I, 26; A. II-I, 22; scutes 20.

Head 3 in length of body (3.58 in total length); depth 3.2 (3.82); pectoral 4.23; eye 4.8 in head; snout 3.

Body rather low; nape not greatly elevated. Profiles evenly and equally curved. Snout rather pointed, much longer than eye, 1.6 times in it; maxillary scarcely reaching front border of eye; lower jaw somewhat included. Teeth on jaws exceedingly fine. Lateral line becoming straight below thirteenth soft dorsal ray, which is at

middle of fin; curved portion slightly longer than straight portion, 1.14 times of it. Scutes not very numerous, small in size, rather weakly armed, and present along posterior half of straight portion of lateral line. Caudal peduncle with six scutes. All parts of gill-cover partially scaled. Pectoral much shorter than depth of body.

Color in formalin brownish* above, light below; all fins light; opercular spot very obscure.

The above description is based upon a specimen from Ryūkyū, Carnegie Museum Cat. of Fishes, No. 7745, measuring 72 mm. in length of body.

The specimen dealt with here perfectly agrees with the original description of this species given by Cuvier and Valenciennes.

The species is distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is not known from Japan proper.

Locality:—Ryūkyū.

Subgenus URASPIS* Bleeker.

Teeth on both jaws in a single or two series; vomer, palatines, and tongue not toothed. Palate and tongue covered with thick membrane. Adipose eyelid rudimentary. Scutes very well armed, present along whole length of straight portion of lateral line; keel on scutes produced, plate-like, armed with a spine in front. Breast rather broadly naked. Soft dorsal and anal not falcate; no rays produced.

This subgenus corresponds to the genus *Uraspis* of Bleeker, who selected *Uraspis carangoides* as the genotype. Three species are known from Japan.

- a. Teeth on both jaws in a single series; ventral shorter than head; body not marked with transverse darker bands.
 - b. Body lower than 2.5 in its length; maxillary not reaching pupil; gill-rakers 1.72 in eye; lateral line a little curved; ventral 1.65 in head; color brown.....*helvola*.
 - bb. Body higher than 2.5 in its length; maxillary reaching pupil; gill-rakers 2.17 in eye; lateral line moderately curved; ventral 1.45 in head; color blackish brown.....*microptera*.
- aa. Teeth on both jaws in two series; ventral equal to head; body crossed with six darker bands.....*uraspis*.

* *Uraspis* being a feminine noun, the specific qualifying adjective must be feminine as shown in the key given below. W. J. HOLLAND.

47. **Caranx (Uraspis) helvolus** (Forster).

(PL. XXVIII, fig. 4.)

Scomber helvolus Forster, Descr. Anim., 1775, p. 415.*Caranx helvolus* Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 443.

—Snyder, Bull. U. S. Fish. Comm., XXII, 1904, p. 524.—Jordan and Evermann, Bull. U. S. Fish. Comm., XXIII, 1905, pl. 32.

D. VI-I, 27; A. O-I, 21; scutes 37.

Head 3.52 in body length (4.11 in total length); depth 2.55 (3); pectoral 3.33; eye 4.58 in head; snout 2.95.

Profiles strongly and almost equally curved. Snout obtuse, longer than eye; maxillary extending to front border of eye; lower jaw longer than upper. Teeth on each jaw rather strong, arranged in a single series. Number of gill-rakers thirteen on lower limb of arch of gill; longest one 1.72 in eye. Lateral line slightly curved, becoming straight below twelfth soft dorsal ray, which is at anterior third of fin; height of arch 8.5 in its width; curved portion a little shorter than straight portion, 1.2 in latter. Caudal peduncle with five scutes. Spinous dorsal low, 2.6 in soft dorsal, which is 1.82 in head. Free anal spines hidden under skin in adult. Pectoral rather longer than head; ventral 1.65 in head and in distance between its insertion and origin of anal.

Color in life uniformly brownish.

The above description is derived from a specimen from Uwajima, Carnegie Museum Cat. of Fishes, No. 7746, measuring 250 mm. in length of body.

The specimen dealt with here quite agrees with the description and the figure by Snyder of a specimen from Hawaii, which the same author had identified with *C. helvolus*.

The species is widely distributed throughout the warmer seas of the Pacific, occurring on the southern coasts of Japan proper.

Localities:—Uwajima; Formosa.48. **Caranx (Uraspis) micropterus** Rüppell.

(PL. XXX, fig. 2.)

Caranx micropterus Rüppell, N. W. Fische., 1835, p. 46, pl. 13, fig. 1.

D. VIII-I, 29; A. I-I, 22; scutes 36.

Head 3.44 in length of body (4.1 in total length); depth 2.36 (2.8); pectoral 3.5; eye 4.7 in head; snout 3.

Shape of body like that of *C. helvolus*, but nape rather more elevated. Snout obtuse, longer than eye; maxillary extending to front border of pupil; lower jaw rather longer than upper. Teeth

on each jaw rather strong, arranged in a single series. Number of gill-rakers thirteen on lower limb of arch of gill; longest one 2.17 in eye. Lateral line moderately arched, becoming straight below thirteenth soft dorsal ray, which is at anterior two-fifths of fin; height of arch 6 in its width, curved portion a little longer than straight portion, 1.15 times of latter. Caudal peduncle with five scutes. Spinous dorsal low, 2.37 in soft dorsal, which is 1.6 in head; first and last spines very short. Free anal spines small, tip of second only visible. Pectoral slightly shorter than head; ventral 1.45 in head, 1.38 in distance between its insertion and origin of anal.

Color in life uniformly dark brown, with somewhat silvery lustre.

The above description is made from a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7747, measuring 210 mm. in the length of body.

The specimen dealt with here quite agrees with the original description and the figure of this species given by Rüppell.

The present species closely resembles *Caranx helvolus*, but differs from it in having a rather higher body, the maxillary reaching the pupil, shorter gill-rakers, a more strongly curved lateral line, a longer ventral, and much darker coloration.

The species is distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is also known from the southern coasts of Japan proper.

Localities:—Kii; Ryūkyū.

49. *Caranx* (*Uraspis*) *uraspis* Günther.

(PL. XXXI, fig. 1.)

Uraspis carangoides Bleeker, Amboina, VI, 1855, p. 418. (Name preoccupied in *Caranx*).

Caranx uraspis Günther, Cat. Fish. Brit. Mus., Vol. II, 1860, p. 444.

D. VIII-I, 28; A. O-I, 21; scutes 33.

Head 3.30 in length of body (3.84 in total length); depth 2.35 (2.74); pectoral 3.47; eye 4.16 in head; snout 3.25.

Shape of body like that of *C. micropterus*. Snout obtuse, longer than eye; maxillary scarcely reaching centre of eye, lower jaw rather longer than upper. Teeth on each jaw in two series. Lateral line moderately arched, becoming straight below thirteenth soft dorsal ray; curved portion a little longer than straight portion, 1.13 times of latter. Caudal peduncle with five scutes. Spinous dorsal low, 2.35 in soft dorsal, which is 1.58 in head; first and last spines very short. Free anal spines rudimentary, hidden under skin in adult. Pectoral a little shorter than head. Ventral equal to head and extending to anal, longer than that of any species in *Caranx*.

Color in formalin brownish, crossed with six dark vertical bands; spinous dorsal blackish; soft dorsal and anal with a white top, intruding into the dark bands, which cross the body; ventral black; opercular spot indistinct.

The above description is based upon a specimen from Nagasaki, Carnegie Museum Cat. of Fishes, No. 7748, measuring 172 mm. in length of body.

The specimen dealt with here quite agrees with the original description of this species given by Bleeker.

This species distinctly differs from *C. helvolus* and *C. micropterus* in having the teeth on the jaws arranged in two series, the ventral as long as the head, and the body crossed with six dark bands.

The species is distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is also known from the southernmost part of Japan proper.

Localities.—Nagasaki; Ryūkyū.

Subgenus SELAROIDES Bleeker.

Teeth on lower jaw in a single series; those on tongue rudimentary; upper jaw, vomer, and palatines not toothed. Scutes weakly armed. Otherwise similar to *Selar*.

This subgenus corresponds to *Selaroides* of Bleeker, who took *Caranx leptolepis* Cuvier and Valenciennes as the type of his genus.

Only one species of this subgenus is known.

50. *Caranx* (*Selaroides*) *leptolepis* (Cuvier and Valenciennes).

(Pl. XXXI, fig. 2.)

Caranx leptolepis Cuvier and Valenciennes, Vol. IX, 1833, p. 63.—Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 440.—Jordan and Evermann, Proc. U. S. Nat. Mus., Vol. XXV, 1903, p. 337.

D. VIII-I, 25; A. II-I, 20; scutes 30.

Head 3.71 in length of body (4.5 in total length); depth 3.5 (4.2); pectoral 3.6; eye 3.45 in head; snout 3.45.

Body low; profiles gradually and equally curved. Snout rather pointed, equal to eye; maxillary reaching front border of eye; lower jaw very slightly longer than upper. Teeth on lower jaw minute, in a single series; those on tongue rudimentary; upper jaw, vomer, and palatines not toothed. Anterior adipose eyelid somewhat developed; posterior eyelid broad, extending to posterior border of pupil. Lateral line scarcely curved, becoming straight below tenth soft dorsal ray;

curved portion longer than straight portion, 1.37 times of latter. Scutes small, scarcely armed, present along whole length of straight portion of lateral line. Caudal peduncle with eight scutes.

Color in formalin brownish; fins light; opercular spot black, very distinct, encroaching on shoulder.

The above description is taken from a specimen from Ryūkyū, Carnegie Museum Cat. of Fishes, No. 7749, measuring 141 mm. in length of body.

Two smaller specimens from Formosa have the body higher and the head rather longer as follows:

Length of body.....	124 mm.	111 mm.
Depth in total length.....	3.64 times	3.58 times
Head in total length.....	4.27 times	4.28 times

The specimens dealt with here quite agree with the original description of this species given by Cuvier and Valenciennes.

It is distributed throughout the Indian Ocean and the tropical seas of the Pacific. It is not known from Japan proper.

Localities.:—Ryūkyū; Formosa.

Subgenus GNATHANODON Bleeker.

Teeth none. Otherwise similar to *Carangoides*.

This subgenus is represented by *C. speciosus*, which is regarded by Gill as the type of the genus *Caranx*, as has been discussed on p. 162.

Only one species of this subgenus is known.

Caranx (Gnathanodon) speciosus (Forskål).

(PL. XXXI, fig. 3.)

Scomber speciosus Forskål, 1775, p. 54.—Seno, Report on Fishery Industry of Formosa, 1910, pl. 7, fig. 3.

D. VIII-I, 19; A. II-I, 16; scutes 15.

Head 3 in length of body (3.72 in total length); depth 2.47 (3); pectoral 3.6; eye 3.62 in head; snout 2.76.

Body oblong; nape elevated; dorsal profile evenly and gradually curved from origin of dorsal to tip of snout. Snout longer than eye; maxillary extending to front border of eye; lower jaw slightly shorter than upper. Teeth none. Adipose eyelid rudimentary. Lateral line moderately arched, becoming straight below eighth soft dorsal ray; curved portion slightly longer than straight portion. Scutes few in number, small in size, weakly armed, present on posterior half of straight portion of lateral line. Breast scaly. Soft dorsal and anal somewhat pointed, but not falcate.

Color in formalin brownish, crossed with five brown vertical bars alternating with five narrower stripes; another bar running down through eye from nape.

The above description is based upon a specimen from Formosa, measuring 86 mm. in length of body.

This species is widely distributed throughout the Indian Ocean, and the tropical seas of the Pacific. It is not known from Japan proper.

Localities.:—Formosa.¹⁷

Genus ULUA¹⁸ Jordan and Snyder.

Gill-rakers very numerous, exceedingly long, feather-like in shape. Otherwise similar to *Caranx*, especially to the subgenus *Citula*.

This genus agrees in many regards with the genus *Leioglossus* of Bleeker, but the dentition is different. It is inconceivable that Bleeker when examining the dentition, should have overlooked the extraordinary gill-rakers of *Ulua richardsoni*, which give the appearance of a mouth-full of feathers. It is the opinion of Dr. Jordan that *Ulua* should be regarded as a distinct genus, its characters being of first importance.

Only a single species of this genus is known.

52. *Ulua richardsoni* Jordan and Snyder.

Ulua richardsoni Jordan and Snyder, Mem. Carnegie Museum, Vol. IV, p. 39, pl. 53.

D. VIII-I, 20; A. II-I, 16; scutes about 20.

Head 3.5 in length of body (4 in total length); depth 2.33 (2.8); pectoral 2.3; eye 5.5 in head; snout 3.

Dorsal profile descending gently from origin of dorsal to occipital, thence rapidly to tip of snout. Snout pointed, much longer than eye; maxillary extending below centre of eye; lower jaw prominently longer than upper. No teeth. Gill-rakers numerous, 24+54, extremely

¹⁷No specimens of this species were sent to the Carnegie Museum. A. W. HENN.

¹⁸In the original manuscript the author sank the genus *Ulua* Jordan and Snyder in the genus *Leioglossus* Bleeker, with reference to *Leioglossus carangoides* Bleeker, Verh. Bat. Gen., Makr., 1851, p. 367. Dr. D. S. Jordan in revising the manuscript modified the generic characterisation, substituting what is given in the two paragraphs printed above, as well as making some slight changes in the account of the species, which Mr. Wakiya confesses that he has never seen. This explanation seems to the Editor to be one which should be given at this point. W. J. HOLLAND.

long, with small lateral setæ, giving them a distinctly feather-like appearance; length of longest one 3.5 in head. Lateral line strongly arched, becoming straight below twelfth dorsal ray, which is at middle of fin; curved portion slightly longer than straight portion. Scutes tolerably well armed, distinct, except a few anterior ones. Naked area of breast extending to axil of pectoral superiorly, and beyond ventral posteriorly. Soft dorsal and anal highly falcate. Caudal lobe 3.25 in length of body; ventral 2.66 in head.

Color in spirit bright silvery, somewhat dusky above; axils black; dorsals narrowly edged with dusky; caudal with dusky margin.

The type of the species is a specimen eighteen inches in length from Takao, Formosa, Carnegie Museum Cat. of Fishes, No. 413. A cotype from the same locality has the soft dorsal decidedly filamentous, the tip extending backward to the middle of the caudal.

No specimen of this species has come under the inspection of the writer. The above description is based upon the original description and the figure given by Jordan and Snyder.

Locality:—Formosa.

Genus ATROPUS Cuvier.

Body strongly compressed, ovate in shape. Top of head, nape, and isthmus trenchant. Abdomen with a deep median groove, into which ventrals are wholly received, when depressed. Teeth on each jaw in a villiform band; vomer, palatines, and tongue toothed. Adipose eyelid rudimentary. Lateral line strongly curved. Scutes present only on straight portion of lateral line. No finlet behind soft dorsal and anal. Ventral not shorter than head.

Only one species of this genus is known.

53. *Atropus atropus* (Bloch and Schneider).

(Pl. XXXII, figs. 1-3.)

Brama atropus Bloch and Schneider, 1801, p. 98, pl. 23.

Caranx nigripes Cuvier and Valenciennes, Vol. IX, 1833, p. 122.

Caranx atropus Günther, Cat. Fish. Brit. Mus., Vol. II, 1860, p. 450.

D. VIII-I, 22; A. II-I, 18; scutes 35.

Head 3.96 in length of body (4.77 in total length); depth 2 (2.43); pectoral 2.6; eye 3.18 in head; snout 3.6.

Body high; nape elevated. Dorsal profile strongly curved at occipital. Snout very obtuse, shorter than eye; maxillary extending beyond front border of pupil; lower jaw longer than upper. Lateral line strongly arched, becoming straight below fourth soft dorsal ray; curved portion shorter than straight portion, 1.67 in latter. Scutes

present along whole length of straight portion of lateral line, but rather weakly armed. Caudal peduncle with five scutes. Cheek with partially imbedded scales; all parts of gill-cover naked, except tops of opercle and preopercle. Naked area of breast extending to pectoral superiorly, and beyond ventrals posteriorly. Several rays of soft dorsal filaments, somewhat produced in male, and slightly so in female, but in young specimens middle rays not filamentous. Pectoral longer than head, 1.5 times of it; ventral equal to head.

Color in formalin brown above, lighter below; spinous dorsal brown; soft dorsal gray, with blackish top and edge; caudal gray; anal and pectoral pale; ventral deep black, with white outer margin; opercular spot indistinct; branchiostegal membrane black.

The above description is derived from a male specimen from Formosa, Carnegie Museum Cat. of Fishes, No. 7750, measuring 214 mm. in length of body.

The older specimens dealt with here quite agree with the original description and figure of this species given by Bloch and Schneider, while a small specimen measuring 124 mm. in length of body, exactly coincides with the original description of *Caranx nigripes* given by Cuvier and Valenciennes.

The species is distributed throughout the Indian Ocean and the tropical areas of the Pacific. It is not known from Japan proper.

Locality:—Formosa.

Genus ALECTIS¹⁹⁻²⁰ Rafinesque.

Body very strongly compressed, subrhomboidal in shape. Top and inferior part of head, nape, and breast trenchant. Teeth on each jaw in a villiform band; vomer, palatines, and tongue toothed. Adipose eyelid rudimentary. Lateral line strongly curved. Scutes present only on straight portion of lateral line, small in size, few in number, and rather weakly armed. Scales minute and imbedded, body apparently naked. Spinous dorsal composed of not numerous, free, rudimentary spines, which disappear with age; anterior rays of soft dorsal and of anal produced into very long filaments. No finlets behind soft dorsal and anal.

¹⁹The differences due to age in this genus are extraordinary, and the value of some of the species here accepted may be questioned. D. S. JORDAN.

²⁰The differences due to age are, as remarked by Dr. Jordan, very great in this genus, especially in the ventrals. It is, however, to be noted that these are proportional to the individuals of the same size among the different species, so that it is possible to distinguish them from each other. Y. WAKIYA.

Five species of this genus are known from Japan.

- a. Depth of preorbital not higher than diameter of eye.
 - b. Depth of body almost equal to its length; width of opercle rather broader than half of its length.....*ciliaris*.
 - bb. Depth of body lower than its length; width of opercle not broader than half of its length.
 - c. Eye longer than snout; preorbital measuring half of eye; interorbital space narrower than diameter of eye.....*indicus*.
 - cc. Eye not longer than snout; preorbital measuring two-thirds of eye; interorbital space equal to diameter of eye.
 - d. Ventral extending far beyond origin of anal; pectoral longer than head.....*temmincki*.
 - dd. Ventral not reaching origin of anal; pectoral equal to head.....*breviventralis*.
- aa. Depth of preorbital much higher than diameter of eye.....*major*.

54. *Alectis ciliaris* (Bloch).

(Pl. XXXII, fig. 4.)

Zeus ciliaris Bloch, Ichthyol., VI, 1788, p. 27, pl. 191.

Caranx ciliaris Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 454.

D. V-I, 19; A. II-I, 16; scutes 12.

Head 2.96 in length of body (3.65 in total length); depth 1.07 (1.29); pectoral 2.7; eye 2.84 in head; snout 3.6.

Depth of body nearly equal to its length. Dorsal profile descending rapidly and in a straight line from origin of soft dorsal to nape, thence, after making a slight curvature at occipital, subvertically to tip of snout; ventral profile ascending straight and slowly from origin of anal to base of ventral, thence rapidly to tip of mandible with a slight concavity. Snout very obtuse, shorter than eye, 1.25 in it; interorbital space narrower than diameter of eye; maxillary extending beyond front border of eye; lower jaw longer than upper. Width of opercle slightly more than half of its length; depth of preorbital equal to half of eye. Lateral line strongly arched, becoming straight below eleventh soft dorsal ray, which is at middle of fin; curved portion slightly longer than straight portion. Scutes few in number, weakly armed, distinct only on posterior half of straight portion of lateral line. Caudal peduncle with five scutes. Anterior seven rays of soft

dorsal and five of anal exceedingly produced, their first rays much longer than twice the length of the body. Pectoral rather longer than head, not very greatly pointed; ventral very long, half of the length of body, extending to base of ninth or tenth anal ray.

Color in formalin brownish, crossed with six blackish subvertical bands; prolonged rays of dorsal and anal becoming black distally; a large black blotch present on soft dorsal, extending between first and seventh soft rays; another black blotch on anal, extending between first and fifth rays; opercular spot black, but not distinct, it being situated on a diffuse blackish blotch on opercle; pectoral pale; ventral deep black.

The foregoing description is drawn from a specimen from the Bonin Islands, Carnegie Museum Cat. of Fishes, No. 7751, measuring 78 mm. in length of body.

The specimens examined exactly agree with the figure of this species given by Bloch.

It may be distinguished from all other species of *Alectis* by the possession of a less curved head and a much longer ventral.

The species is widely distributed throughout the Indian Ocean and the tropical seas of the Pacific, but is rare in Japan proper.

Localities:—Misaki, Bonin Islands.

55. *Alectic indicus* (Cuvier and Valenciennes).

Blepharis indicus Cuvier and Valenciennes, Vol. IX, 1833, p. 154.

Blepharis fasciatus Rüppell, Atl. Fische, 1828, p. 129, pl. 33, fig. 2 (*non* Richardson).

Caranx ciliaris Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 454.

D. V-I, 19; A. II-I, 16; scutes 17.

Head 2.9 in length of body (3.5 in total length); depth 1.23 (1.52); pectoral 2.5; eye 2.54 in head; snout 3.47.

Depth of body lower than its length. Dorsal profile descending straight and rather rapidly from origin of soft dorsal to nape, thence, making an arc of a circle, to snout, which descends subvertically. Snout exceedingly obtuse, shorter than eye; interorbital space narrower than diameter of eye; maxillary extending beyond front border of eye; lower jaw longer than upper. Width of opercle 2.33 in its length; depth of preorbital equal to half of eye. Lateral line strongly arched, becoming straight below eleventh soft dorsal ray, which is at middle of fin; curved portion slightly shorter than straight portion. Scutes weakly armed, but comparatively numerous, distinct on posterior three-fifths of straight portion of lateral line. Caudal peduncle with five scutes. Anterior soft rays of dorsal and anal

prolonged, just like those of *Alectis ciliaris*. Pectoral long, much more pointed than that of *Alectis ciliaris*; ventral 4.3 in length of body, just reaching to origin of anal.

Color just like that of *Alectis ciliaris*, except that the ventral is much lighter.

The foregoing description is based upon a specimen from the Bonin Islands, measuring 90 mm. in the length of the body.

The specimen here dealt with agrees exactly with the figure and description of this species given by Rüppell, and also with the description of *Blepharis indicus* given by Cuvier and Valenciennes.

Though the species resembles *A. ciliaris* so closely that it has been regarded by Günther and many other ichthyologists as a synonym of the latter, it not only differs from that species in having a less elevated body, a more strongly curved head, and a much more pointed pectoral, as remarked by Cuvier and Valenciennes, but also in having a rather larger eye, a much narrower opercle, and a shorter and lighter ventral.

The species is as widely distributed as *A. ciliaris*, but is not known from Japan proper.²¹⁻²²

Locality:—Bonin Islands.

56. *Alectis temmincki* Wakiya, sp. nov.

Blepharis indicus Temminck and Schlegel (*non* Cuvier and Valenciennes), 1844, p. 113, pl. 60, fig. 2.

Caranx ciliaris Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 454.

D. V-I, 19; A. II-I, 16; scutes 15.

Head 3 in length of body (3.6 in total length); depth 1.29 (1.54); pectoral 2.45; eye 3.07 in head; snout 3.1.

Depth of body rather lower than its length. Dorsal profile descending almost straight and rather rapidly from origin of soft dorsal to nape, thence making a slight curvature to tip of snout. Snout obtuse, equal to eye, or slightly shorter than eye; interorbital space equal to eye; maxillary extending beyond front border of eye; lower jaw longer than upper. Width of opercle 2.33 in its length; depth of preorbital two-thirds of eye. Lateral line strongly arched, becoming straight below twelfth soft dorsal ray, which is a little behind middle of fin; curved portion almost equal to straight portion, 107 of it.

²¹No specimen of this species was received from Mr. Wakiya by the Carnegie Museum. A. W. HENN.

²²It is possibly the adult form of *A. ciliaris*. D. S. JORDAN.

Scutes weakly armed, distinct along posterior half of lateral line. Caudal peduncle with five scutes. Anterior rays of soft dorsal and of anal produced just like those of *A. ciliaris*. Pectoral longer than head, more pointed than that of *A. ciliaris*; ventral 2.3 in length of body, extending to fifth or sixth anal ray.

Color in formalin like that of *A. ciliaris*, but ventral much lighter.

The foregoing description is based upon the type, a specimen from the Bonin Islands, Carnegie Museum Cat. of Fishes, No. 7752, measuring 120 mm. in the length of body.

The specimen here dealt with is identical with that from Nagasaki described and figured by Temminck and Schlegel as *Blepharis indicus* Cuvier and Valenciennes, from which species it differs in having a longer ventral, a smaller eye, and a higher preorbital in comparison with the eye.²³ It is also distinct from *A. ciliaris* in having a lower body, a more strongly curved head, and a narrower opercle.

The species is rather common in the warmer waters of Japan proper.

Localities.—Tosa; Nagasaki; Bonin Islands.

57. ***Alectis breviventralis*** Wakiya, sp. nov.

(PL. XXXIII)

D. V-I, 19; A. II-I, 16; scutes 12.

Head 3 in length of body (3.6 in total length); depth 1.35 (1.63); pectoral 3; eye 3.38 in head; snout 3.

Depth of body lower than length of body. Dorsal profile descending straight and rather slowly from origin of soft dorsal to nape, thence to tip of snout, making an arc of a circle. Snout obtuse, rather longer than eye; interorbital space equal to eye; maxillary extending to front border of eye; lower jaw longer than upper. Width of opercle half of its length; depth of preorbital about two-thirds of eye. Lateral line strongly arched, becoming straight below eleventh soft dorsal ray, which is at middle of fin; curved portion rather longer than straight portion, 1.15 in latter. Scutes few in number, weakly armed, distinct only on posterior half of straight portion of lateral line. Caudal peduncle with five scutes. Anterior rays of soft dorsal and of anal produced just like those of *A. ciliaris*. Pectoral equal to head, much more pointed than that of *A. ciliaris*; ventral comparatively short, 4 in length of body, 1.5 in distance between its insertion and origin of anal.

Color in formalin just like that of *A. ciliaris*, but ventral much lighter.

The foregoing description is based upon the type, a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7753, measuring 116 mm. in length of body.

²³It may, however, be the young of that species. D. S. JORDAN.

The proportions of the different parts of the body vary in accordance with the size of the specimens as follows:

Length of body.	83 mm.	83 mm.	90 mm.	104 mm.	116 mm.	127 mm.	130 mm.
Head in length of							
body.....	3.04 times	3.00 times	3.00 times	3.05 times	3.00 times	3.07 times	3.05 times
Depth in length							
of body.....	1.20 times	1.22 times	1.20 times	1.30 times	1.35 times	1.33 times	1.33 times
Eye in head....	3.05 times	3.11 times	3.06 times	3.23 times	3.00 times	2.93 times	2.80 times
Snout in head..	3.05 times	3.11 times	3.15 times	3.10 times	3.00 times	2.93 times	2.80 times
Pectoral in							
length of body	2.90 times	3.07 times	2.90 times	2.90 times	3.00 times	2.90 times	2.85 times
Ventral in length							
of body.....	3.45 times	3.60 times	4.00 times	4.33 times	4.72 times	4.80 times	4.98 times
Ventral in dis-							
tance between							
its insertion							
and origin of							
anal.....	2.20 times	1.35 times	1.36 times	1.45 times	1.50 times	1.60 times	1.51 times

The present species can easily be distinguished from *A. ciliaris* and its allied species by the possession of a lower body, a smaller eye, a shorter pectoral, and a much shorter ventral.²⁴

The species is common in the warmer waters of Japan proper.

Localities:—Tōkyō Bay; Kii; Uwajima; Ryūkyū; Formosa; Bonin Islands.

58. *Alectis major* (Cuvier and Valenciennes).

(PL. XXXIV, fig. 1.)

Gallichthys major Cuvier and Valenciennes, Vol. IX, 1833, p. 168, pl. 254.

Caranx gallus Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 455.

Alectis ciliaris Jordan and Evermann, (*non* Bloch) Proc. U. S. Nat. Mus., XIV, 1903, p. 338.—Seno (*non* Bloch) Report on Fishery Industry of Formosa, 1910, p. 119.

Alectis major Jordan and Richardson, Mem. Carnegie Museum, Vol. IV, 1909, p. 180.

D. VI-I, 19; A. II-I, 16; scutes 8.

Head 2.75 in length of body (3.51 in total length); depth 1.33 (1.66); pectoral 2.55; eye 4 in head; snout 2.25.

Dorsal profile descending straightly and rather rapidly from origin of soft dorsal to nape; thence very rapidly to tip of snout, making a

²⁴This fin, however, rapidly grows shorter with age in this group. D. S. JORDAN.

strong angle at occipital; ventral profile ascending nearly straight and rather rapidly from origin of anal to tip of mandible. Snout obtuse, but much longer than eye, about twice of it; maxillary scarcely reaching below anterior nostril; opercle 1.6 in its length; depth of preorbital much deeper than diameter of eye, 1.7 of it. Lateral line strongly arched, becoming straight below tenth soft dorsal ray, which is at middle of fin. Scutes not very numerous, weakly armed, distinct only on posterior half of straight portion of lateral line. Caudal peduncle with five scutes. Anterior nine dorsal rays and three anal rays produced into long filaments; first dorsal ray rather longer than length of body. Pectoral rather longer than head; outer three rays of ventral produced into long filaments, its first ray reaching caudal.

Color in formalin uniformly brownish, with no traces of darker cross-bands on body; anterior portions of soft dorsal and anal gray, with produced rays deep black and without black blotches; ventral distally deep black.

The foregoing description is based upon a specimen from Formosa, Carnegie Museum Cat. of Fishes, No. 7754, measuring 130 mm. in length of body.

The specimen here dealt with quite agrees with the original description and figure of this species given by Cuvier and Valenciennes. On examining a specimen from Formosa identified by Jordan and Evermann with *A. ciliaris*, and which is now preserved in the Museum of Suisan-Kōsyūjo, the writer has found that it is certainly this species, as has already been indicated by Jordan and Richardson.

The species is distributed through the Indian Ocean, and the tropical seas of the Pacific, but it is not known from Japan proper.

Locality:—Formosa.

Subfamily TRACHYNOTINÆ.

Body much compressed, oblong in shape, much elevated at middle. Head trenchant at top. Premaxillary protractile. Teeth present on jaws, vomer, and palatines, but in some species becoming lost with age. Gill-rakers normal in shape. Scales small, cycloid. Lateral line scarcely curved, not armed with scutes, not developed into a keel on each side of caudal peduncle. Spinous dorsal composed of a few, short, free spines. Soft dorsal and anal highly falcate anteriorly; anal equal to soft dorsal, much longer than abdomen. Pectoral short, not pointed; ventral also short.

Only a single genus is known in this subfamily.

Genus TRACHYNOTUS Lacépède.

The generic characters are the same as those of the subfamily.

Four species of this genus are known from Japan, two of which are new to science.

- a. Lower jaw not longer than upper; anterior nostril much smaller than posterior, scales very small.
- b. Caudal lobe 3.5 in total length; lobe of soft dorsal and of anal not longer than their own bases.
 - c. Head 4.5 in length of body; pectoral 6; ventral 10; soft dorsal rays 24; soft anal rays 23. *bailloni*.
 - cc. Head 3.5 in length of body; pectoral 5.3; ventral 8; soft dorsal rays 22 or 23; soft anal rays 22. *cuvieri*, sp. nov.
 - bb. Caudal lobe 3 in length of body; lobe of soft dorsal and of anal longer than their own bases. *quadripunctatus*.
- aa. Lower jaw longer than upper; anterior nostril as large as posterior; scales rather large. *jordani*, sp. nov.

59. *Trachynotus bailloni* (Lacépède).

Cæsiomorus bailloni Lacépède, 1802, p. 93, pl. 3, fig. 1.

Trachynotus bailloni Cuvier and Valenciennes, (*partim*), Vol. III, 1831, p. 431.—Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 484.—Seno, Report on Fishery Industry of Formosa, 1910, p. 119, pl. 5, upper figure.

D. VI-I, 24; A. II-I, 23.

Head 4.44 in length of body (5.8 in total length); depth 2.3 (3.07); pectoral 6.1; ventral 10; eye 4.3 in head; snout 4.

Snout obtuse, rather longer than eye. Maxillary extending to front border of pupil; lower jaw slightly shorter than upper. Anterior nostril smaller than half of posterior, midway between tip of snout and front border of eye. Jaws, vomer, and palatines toothed. Scales small. Top of soft dorsal a little less than length of its base; that of anal nearly equal to its base. Caudal lobe 3.5 in total length.

Color in formalin brown above, lighter below; four small black spots on lateral line; the first below origin of spinous dorsal; the second below fifth spine; the third below sixth ray of soft dorsal; and the fourth below the sixteenth ray; the anterior two spots being rather larger than pupil, twice the size of the two posterior spots. The three anterior rays of soft dorsal and of anal black; outer rays of caudal blackish.

The foregoing description is based upon a specimen from Formosa, measuring 190 mm. in length of body.²⁵

²⁵No specimen of this species was sent to the Carnegie Museum. A. W. HENN.

The specimen dealt with here quite agrees with the description and figure of this species given by Lacépède.

The species is widely distributed throughout the Indian Ocean and the tropical portions of the Pacific. It is not known from Japan proper.

Locality:—Formosa.

60. **Trachynotus cuvieri** Wakiya, **sp. nov.**

Trachynotus bailloni Cuvier and Valenciennes (*partim*), Vol. VIII, 1831, p. 431.

D. VI-I, 22; A. I-I, 22.

Head 3.7 in length of body (5 in total length); depth 2.4 (3.2); pectoral 5.33; ventral 8; eye 4.5 in head; snout 3.5.

Snout longer than eye, its tip subvertical. Maxillary extending to point below center of eye. Top of soft dorsal 1.4 in its base; that of anal 1.3 in its base. Caudal lobe 3.65 in total length. Four small black spots on lateral line of which the second and third are rather larger than the other two, but only one-half diameter of pupil. Otherwise similar to *T. bailloni*.

The foregoing description is based upon a specimen from Misaki, measuring 120 mm. in length of body.²⁶

The specimen dealt with here is identical with that from the Indian Ocean, which was described by Cuvier and Valenciennes as *T. bailloni* Lacépède, but differs from it in having a much longer head, a blunter snout, the pectoral and the ventral longer, the soft dorsal and the anal rather lower, the dorsal rays somewhat less numerous, and the black spots on the side of the body smaller.

The species seems to be distributed throughout the Indian Ocean and the warm seas of the Pacific. It is only occasionally found along the warmer coasts of Japan proper.

Localities:—Misaki; Uwajima; Ryūkyū; Formosa.

61. **Trachynotus quadripunctatus** (Rüppell).

(Pl. XXXIV, fig. 2.)

Cæsiomorus quadripunctatus Rüppell, Atl. Fische, 1828, p. 90, pl. 24, fig. 1.

Trachynotus bailloni Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 484.

D. VI-I, 23; A. II-I, 22 or 23.

Head 3.9 in length of body (5.36 in total length); depth 2.16 (3); pectoral 5.5; ventral 8.4; eye 4.55 in head; snout 3.9.

²⁶Neither the type nor any other specimen of this species was sent by Dr. Wakiya to the Carnegie Museum. A. W. HENN.

Snout rather obtuse, longer than eye. Maxillary extending a little beyond front border of pupil. Anterior nostril smaller than half of the posterior, rather nearer to eye than to tip of snout. Jaws, vomer, and palatines toothed. Scales minute. Anterior part of lateral line somewhat wavy. Top of soft dorsal equal to its base; that of anal a little longer than its base. Caudal lobe 3.1 in total length.

Color in formalin brown above, lighter below; two small black spots on lateral line; the first below the fifth spine of spinous dorsal, the second below the fifth soft dorsal ray; anterior rays of soft dorsal and anal and outer margins and tips of caudal black.

The foregoing description is derived from a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7755, measuring 160 mm. in length of body.

The specimen here dealt with quite agrees with the description and the figure of this species given by Rüppell. The species closely resembles both *T. bailloni* and *T. cuvieri*, but may be easily distinguished from both by its having the lobes of dorsal, anal, and caudal longer, and by its having smaller scales.

It is distributed throughout the Indian Ocean, and the tropical areas of the Pacific. It is rarely taken along the warmer coasts of Japan proper.

Localities:—Kii; Ryūkyū; Formosa.

62. *Trachynotus jordani* Wakiya, *sp. nov.*

(Pl. XXXV, fig. 1.)

D. V-I, 23; A. II-I, 22.

Head 4.12 in length of body (6.25 in total length); depth 2.53 (3.83); pectoral 5.6; ventral 15; eye 3.6 in head; snout 3.6.

Snout obtuse; maxillary extending to front border of pupil; lower jaw rather longer than upper. Anterior nostril as large as posterior, nearer to front border of eye than to tip of snout. Jaws, vomer, and palatines toothed. Scales rather large, partially imbedded. Lateral line slightly curved anteriorly. Top of soft dorsal 1.64 in its base; that of anal 1.47 in its base. Caudal lobe 3.33 in total length.

Color in formalin dark brown above, light below; four black spots on middle of side of body; the two anterior spots smaller than pupil, and located just above lateral line in front of spinous dorsal; the two posterior spots larger than pupil, located on the lateral line, one below the third spine of the spinous dorsal, the other below the fifth dorsal ray; dorsal, anal, and caudal blackish, margined with white; paired fins pale.

The foregoing description is drawn from the type, a specimen from the Bonin Islands, Carnegie Museum Cat. of Fishes, No. 7756,

measuring 297 mm. in the length of the body. The type is unique, being the only specimen which has so far come to hand.

The species is named after Dr. David Starr Jordan.

Locality:—Bonin Islands.

Subfamily SERIOLINÆ.

Body somewhat compressed, oblong in shape, not much elevated at middle, with abdomen rounded. Head pointed, scarcely, or but slightly compressed. Premaxillary protractile. Teeth in villiform bands, present on jaws, vomer, palatines, and tongue. Gill-rakers mostly normal in shape. Scales small, cycloid, partially imbedded. Lateral line slightly curved anteriorly, not armed with scutes, but mostly developing a keel on each side of the caudal peduncle. Spinous dorsal composed of several spines connected with membrane, or of short free spines; anal with detached spines much shorter than soft dorsal, not longer than abdomen. Generally no finlets behind soft dorsal and anal, but a single one in some species. Pectoral short, roundish, usually not longer than ventral.

Four genera of this subfamily are known from Japan.

- a.* No finlets behind soft dorsal and anal.
- b.* Spines of spinous dorsal connected with membrane.
- c.* Gill-rakers normal in shape.....*Seriola*.
- cc.* Gill-rakers transformed into knob-like masses...*Seriolina*.
- bb.* Spines of spinous dorsal free.....*Naucrates*.
- aa.* A finlet behind soft dorsal and anal.....*Elagatis*.

Genus SERIOLA Cuvier.

Spinous dorsal composed of five to seven spines connected with membrane; no finlets behind soft dorsal and anal. Lateral line more or less developed into a keel on each side of caudal peduncle.

Four species of this genus are known from Japan.

- a.* Head not greatly curved; snout pointed; maxillary extending to front border of eye in adult; about two hundred scales; gill-rakers on lower limb twenty or more.
- b.* Spinous dorsal with six spines (seven in young); snout nearly equal to interorbital space; highest dorsal spine not higher than three times in highest soft dorsal ray; pectoral shorter than ventral; posterior end of maxillary with roundish upper corner.....*aureovittata*.

- bb.* Spinous dorsal with five spines (six in young); snout rather longer than interorbital space; highest spine not lower than 2.5 in highest soft dorsal ray; pectoral not shorter than ventral; posterior end of maxillary with an acute upper corner. *quinqueradiata*.
- aa.* Maxillary nearly reaching center of eye in adult; about one hundred and fifty scales; gill-rakers upon lower limb about twenty.
- c.* Depth of body not lower than length of head; depth of caudal peduncle nearly equal to its length. *purpurascens*.
- cc.* Depth of body lower than length of head; depth of caudal peduncle not more than 1.43 in its length. *cristata*.

63. *Seriola aureovittata* Temminck and Schlegel.

(Pl. XXXV, fig. 2.)

Seriola aureovittata Temminck and Schlegel, 1844, p. 115, pl. 62, fig. 1.

Seriola lalandi Günther (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 463.

D. VII (VI)-I, 34-36; A. II (O)-I, 20-22; scales about 200; vert. 25 (11+14).

Head 3.62 in length of body (4.44 in total length); depth 3.71 (4.45); eye 6 in head; snout 3; maxillary 2.55; pectoral 1.9; ventral 1.56.

Body rather strongly compressed; its thickness about twice in depth. Dorsal profile of head slightly curved. Snout subconical, much longer than eye, twice as long, and equal to interorbital space. Maxillary extending somewhat beyond front border of eye (to front border of eye in full-grown specimens, and to center of eye in youngest); its posterior end slightly convex, with roundish corners, its breadth 3 in length. Gill-rakers 8-20, anterior two or three on lower limb rudimentary, longest a little shorter than eye. Depth of caudal peduncle 1.33 in its length; keel on its side distinct. Spinous dorsal commencing at point equal to diameter of eye behind base of pectoral, with seven spines, but the last one very short, not clearly visible in specimens longer in the length of body than 400 mm.; third or fourth spines highest, rather shorter than eye, 6.5 in head, 3.2 in highest soft dorsal ray, which is 2 in head. Anal spines short, not clearly visible in full-grown specimens. Origin of soft anal below anterior two-fifths of soft dorsal. Ventral just behind base of pectoral, rather longer than latter, 2 in distance between its insertion and origin of anal. Caudal lobe rather longer than head. Pyloric cæca about two hundred in number, rather short and thick; longest ones about one-third of head.

Color in life steel-blue above, lead-white below; a distinct yellow longitudinal band running from snout to caudal peduncle; ventral yellow; other fins olivaceous, with yellowish margins.

The above description is drawn from a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7757, measuring 300 mm. in length of body.

The proportions of the parts of the body vary greatly in accordance with the size of the specimens as follows:

Length of body.....	615 mm.	535 mm.	454 mm.	300 mm.	290 mm.
Head in length of body...	3.80 times	3.80 times	3.69 times	3.62 times	3.62 times
Depth in length of body...	3.90 times	4.12 times	3.90 times	3.71 times	3.71 times
Eye in head.....	6.80 times	6.71 times	6.47 times	6.01 times	5.92 times
Eye in snout.....	2.54 times	2.50 times	2.31 times	2.02 times	2.00 times
Pectoral in head.....	2.00 times	2.00 times	2.05 times	1.90 times	1.90 times
Ventral in head.....	1.63 times	1.65 times	1.78 times	1.56 times	1.56 times
Ventral in distance between its insertion and origin of anal.....	2.25 times	2.22 times	2.23 times	1.94 times	1.94 times
Highest dorsal spine in head	7.50 times	7.00 times	7.23 times	6.50 times	6.40 times
Highest dorsal spine in soft dorsal.....	3.57 times	3.40 times	3.50 times	3.20 times	3.12 times
Soft dorsal in head.....	2.16 times	2.06 times	2.05 times	2.00 times	2.05 times

Although Günther has united this species with *S. lalandi*, under the assumption that Temminck and Schlegel's figure is not correct, the specimens here dealt with accord so exactly with the original description and the figure given by the authors of *S. aureovittata*, that Günther's view cannot be considered valid. It is true that this species bears some resemblance to *S. lalandi* in the shape of the body, the number of the rays of the soft dorsal and the anal, and the coloration, but that species of the Atlantic differs very distinctly from the present fish in having the maxillary broader and much more strongly curved at its posterior end, and extended to the center of the eye, the spinous dorsal as high as 2.3 in the soft dorsal, and the ventral inserted beneath the base of the pectoral. It is therefore not admissible to regard the two species as the same.

The species is distributed throughout the temperate seas of eastern Asia, but it is rare northward on the coasts of Japan beyond the Kinkazan Peninsula on the east, and the Tsugaru Strait on the west.

Localities.—Sendai Bay; Tōkyō Bay; Kii; Kumamoto; Gensan and Chemulpo (Korea); Port Arthur.

64. *Seriola quinqueradiata* Temminck and Schlegel.

(PL. XXXVI fig. 1.)

Seriola quinqueradiata Temminck and Schlegel, 1844, p. 115, pl. 62, fig. 2.—

Steindachner and Döderlein, Vol. III, 1884, p. 185.

Seriola lalandi Steindachner and Döderlein (*non* Cuvier and Valenciennes),

Vol. III, 1884, p. 185.

Seriola aureovittata Jordan, Tanaka, and Snyder, (*non* Temminck and Schlegel),

Cat. Fishes of Japan, 1913, p. 127, fig. 90.

D. VI (V)-I, 30-34; A. II-I, 17-20; scales about 200; vert. 24 (10+14).

Head 3.4 in length of body (4.1 in total length); depth 3.9 (4.6); eye 8.1 in head; snout 2.7; maxillary 2.52; pectoral 2.12; ventral 2.15.

Body a little compressed, its thickness about 1.5 in depth. Dorsal profile of head nearly straight. Snout pointed, conical, very much longer than eye, three times of it, and rather longer than interorbital space. Maxillary extending somewhat beyond front border of eye (scarcely to front of eye in full-grown specimens, and nearly to center of eye in younger); its posterior end straight, with acute upper corner and roundish lower corner, decidedly inclined backward; its breadth 3.1 in length. Preopercle descending backward rather more obliquely, and more strongly curved at angle than in all other species of *Seriola* from Japan. Gill-rakers 8 to 10-20 to 23; first or second anterior rakers on lower limb rudimentary; highest rakers equal to, or a little longer than eye, but slightly shorter in young specimens. Depth of caudal peduncle about 2 in its length; keel on its sides very distinct. Spinous dorsal commencing at a point nearly twice diameter of eye from behind base of pectoral; six spines, the last very short, not plainly visible in adults; second or third spine longer than eye, 6.8 in head, 2.53 in highest soft dorsal ray, which is 2.7 in head. Anal spines short, tip of second spine barely visible in full-grown specimens. Origin of soft anal below middle of soft dorsal. Ventral inserted below posterior part of base of pectoral, not longer than latter, 2.7 between its insertion and origin of soft anal. Caudal lobe rather shorter than head. Pyloric cæca slender, very numerous, varying from four hundred to five hundred; longest cæcum 1.5 in head.

Color in life like that of *S. aureovittata*, but yellow longitudinal band on side fainter and more diffuse, and vertical fins faintly tinged with yellow.

The foregoing description is drawn from a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7758, measuring 350 mm. in length of body.

The proportions of the parts of the body vary greatly in accordance with the size of the specimens as follows:

I.

Length of body.....	795 mm.	735 mm.	350 mm.	300 mm.	295 mm.
Head in the total length..	4.18 times	3.98 times	4.08 times	4.11 times	4.00 times
Head in length of body...	3.53 times	3.50 times	3.40 times	3.43 times	3.31 times
Depth in total length.....	4.50 times	4.97 times	4.61 times	4.80 times	4.66 times
Depth in the length of body	3.78 times	4.23 times	4.02 times	3.91 times	3.93 times
Eye in head.....	9.00 times	8.48 times	8.10 times	8.00 times	8.00 times
Snout in head.....	2.74 times	2.65 times	2.78 times	2.80 times	2.80 times
Eye in snout.....	3.28 times	3.20 times	2.91 times	2.85 times	2.85 times
Pectoral in head.....	2.25 times	2.16 times	2.12 times	2.12 times	2.12 times
Ventral in head.....	2.47 times	2.30 times	2.12 times	2.12 times	2.07 times
Ventral in distance between its insertion and origin of anal.....	3.40 times	3.00 times	2.70 times	2.60 times	2.53 times
Third spine in soft dorsal..	2.62 times	2.83 times	2.53 times	2.47 times	2.46 times
Soft dorsal in head.....	2.62 times	2.75 times	2.83 times	2.70 times	2.78 times
Third spine in head.....	7.76 times	8.00 times	6.80 times	6.40 times	6.83 times
Depth of caudal peduncle in its length.....	2.00 times	2.04 times	1.90 times	1.90 times	1.88 times

II.

Length of body.....	185 mm.	163 mm.	151 mm.	142 mm.	135 mm.
Head in total length.....	3.85 times	3.90 times	3.91 times	4.00 times	3.90 times
Head in length of body...	3.27 times	3.25 times	3.28 times	3.42 times	3.30 times
Depth in total length.....	5.10 times	5.00 times	4.90 times	4.60 times	4.90 times
Depth in length of body..	4.34 times	4.18 times	4.08 times	3.84 times	4.05 times
Eye in head.....	6.50 times	6.25 times	6.13 times	6.07 times	5.12 times
Snout in head.....	2.83 times	2.77 times	2.87 times	2.83 times	2.95 times
Eye in snout.....	2.30 times	2.25 times	2.13 times	2.14 times	1.75 times
Pectoral in head.....	2.18 times	2.12 times	2.09 times	1.93 times	1.95 times
Ventral in head.....	2.06 times	2.08 times	2.09 times	1.93 times	1.95 times
Ventral in distance between its insertion and origin of anal.....	2.40 times	2.33 times	2.28 times	2.28 times	2.33 times
Third spine in soft dorsal.	2.30 times	2.12 times	2.28 times	2.28 times	2.33 times
Soft dorsal in head.....	2.64 times	2.94 times	2.87 times	2.65 times	2.90 times
Third spine in head.....	6.55 times	6.25 times	6.57 times	6.70 times	6.80 times
Depth of caudal peduncle in its length.....	1.87 times	1.71 times	1.70 times	1.68 times	1.60 times

Among the specimens dealt with here those attaining about 500 mm. in length of body exactly agree with the description and the figure of this species given by Temminck and Schlegel, while those measuring from 150 mm. to 200 mm. accord with the description of Steindachner and Döderlein.

The species is distinct from all other species of *Seriola* from Japanese waters in having a less curved head; a longer and more pointed snout; a smaller eye; the maxillary with an acute upper corner at its posterior end and decidedly inclined backward; the preopercle obliquely descending backward and strongly curved at the angle; the gill-rakers not shorter than the eye; a slenderer caudal peduncle; the pectoral not shorter than the ventral; the soft dorsal as low as 2.8 in the head; and much more numerous and longer pyloric cæca. The species approaches nearer to *S. aureovittata* than any other, but it can easily be distinguished from the rest, not merely by the above mentioned peculiarities, but by the number of vertebrae, the proportion of the highest spine of the spinous dorsal to the highest soft dorsal ray, the length of the caudal lobe in comparison with the head, and the coloration in life.

Two small specimens from Japan, which have been identified by Steindachner with *S. lalandi*, according to the description given by that author, have six spines in the spinous dorsal, the head rather longer than 4 in the total length, the depth about 5, the eye 5 in the head, the snout 3, the ventral 2.6 in the distance between its insertion and the origin of the anal, and the maxillary extending to the center of the eye. I infer from these peculiarities that they are neither *S. lalandi* Cuvier and Valenciennes, nor *S. aureovittata* Temminck and Schlegel, but the young of the present species, measuring about 130 mm. in length of body. A specimen from Japan figured by Jordan, Tanaka, and Snyder as *aureovittata* must also belong to this species, since all the characters, which can be ascertained from their figure, exactly accord with the peculiarities of the present species.

The species ranges through the temperate seas of eastern Asia, like *S. aureovittata*, and it is found as far north as the southern coasts of Sakhalin, but it does not extend southward beyond the southernmost coast of Kyūshū.

Localities.—Aomori; Toyama; Miyako; Sendai Bay; Tōkyō Bay; Kii; Uwajima; Kagoshima; Kumamoto; Fusan; Genjan and Seishin (Korea).

65. *Seriola purpurascens* Temminck and Schlegel.

(PL. XXXVI, fig. 2.)

Seriola purpurascens Temminck and Schlegel, 1844, p. 113, pl. 61.*Seriola dumerili* Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 462.—Steindachner and Döderlein (*non* Risso), Vol. III, 1884, p. 186.

D. VII (VI)-I, 32 or 33; A. II-I, 19 to 22; scales 150; vert. 24 (10+14).

Head 3.3 in length of body (4 in total length); depth 3 (3.55); eye 5.7 in head; snout 2.65; maxillary 2.27; pectoral 2; ventral 1.8.

Body rather strongly compressed; its thickness twice in depth. Dorsal profile evenly and rather strongly curved from origin of dorsal to tip of snout. Depth of body not less than length of head. Snout obtuse, much longer than eye, 2.15 of it, and rather longer than interorbital space. Maxillary reaching center of eye; its posterior end broad and convex with rounded corners; its breadth 2.6 in length. Gill-rakers 4 to 6/12 to 15; anterior first or second rakers on lower limb rudimentary; longest ones 1.4 in eye. Depth of caudal peduncle nearly equal to its length (rather less than its length in adults); keel on each side rather distinct. Spinous dorsal commencing at point equal to half diameter of eye behind base of pectoral; with seven spines, but the last one very short, not plainly visible in full-grown specimens; third spine highest, rather longer than eye, 2.1 in highest soft dorsal ray, which is 22 in head. Anal spines short, not plainly visible in adult. Origin of soft anal only a little before middle of soft dorsal. Ventral below posterior part of base of pectoral, rather longer than latter, 2.2 in distance between its insertion and origin of soft anal. Caudal lobe rather shorter than head. Fifty to sixty pyloric cæca, the longest half of head.

Color in life purplish brown above, whitish below; a yellow longitudinal band from behind middle of upper jaw to base of caudal through eye; fins dark olivaceous, anal edged with white.

The above description is drawn from a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7759, measuring 285 mm. in length of body.

The measurement of another specimen from Nagasaki, which is 600 mm. in length, is as follows: head 3.46 in length of body; depth 3.4; eye 6.18 in head; snout 2.62; interorbital space 2.88; maxillary 2.45; pectoral 2.11; ventral 1.88; highest ray of soft dorsal 2.25; highest spine 4.52; depth of caudal peduncle 1.13 in its length.

The specimens examined closely agree with the original description and figure of this species given by Temminck and Schlegel.

The species closely resembles *S. dumerili*, but differs from it in the proportion of the maxillary in the head, the position of the origin of the spinous dorsal in reference to the base of the pectoral, and the coloration of the body; the species found in the Atlantic having the maxillary as long as 2.1 in the head, the spinous dorsal commencing above the base of the pectoral, and the body not tinged with purple. It attains six feet in length and one hundred pounds in weight.

The distribution of this species is similar to that of *S. aureovittata*, and it also extends along the coasts of the Yellow Sea.

Localities:—Tōkyō Bay; Kii; Uwajima; Kumamoto; Niigata; Toyama Bay.

66. *Seriola cristata* Döderlein.

(Pl. XXXVII, fig. 1.)

Seriola cristata Döderlein, Vol. III, 1884, p. 186.

Seriola dumerili Günther, (*non* Risso) Südsee Fische, Vol. V, 1876, p. 136, pl. 10, fig. a.

Seriola purpurascens Jordan and Evermann, (*non* Temminck and Schlegel), Bull. U. S. Fish. Commission, Vol XXIII, 1905, p. 183.

Seriola aureovittata Jordan, Tanaka, and Snyder (*partim*), Cat. Fishes of Japan, 1913, p. 127.

D. VI-I, 33; A. O-I, 21; scales about 150; vert. 24 (10+14).

Head 3.44 in length of body (4.1 in total length); depth 3.73 (4.45); eye 5.5 in head; snout 2.8; maxillary 2.32; pectoral 2; ventral 1.75.

Body a little compressed, its thickness about 1.5 in depth. Dorsal profile evenly and rather strongly curved from nape to tip of snout. Snout obtuse, longer than eye, twice its diameter, and a little longer than interorbital space. Maxillary extending to center of eye; its posterior end broad and convex, with rounded corners; its breadth 2.6 in length. Gill-rakers 6/15; anterior three on lower limb rudimentary; longest 1.46 in eye. Depth of caudal peduncle 1.43 in length; keel on the sides rather distinct. Spinous dorsal commencing at point equal to half of diameter of eye behind base of pectoral; spines six in number, the last one very short, only its tip being visible; third spine the highest, slightly longer than the eye, 4.76 in head, 2.05 in highest soft dorsal ray, which is 2.32 in head. Anal spines rudimentary; their tips not plainly visible. Origin of anal below anterior two-fifths of soft dorsal. Ventral inserted below just behind base of pectoral, rather longer than latter, 2 in distance between its insertion and origin of anal. Caudal lobe equal to head. Pyloric cæca forty in number; longest about half of head.

Color like that of *S. purpurascens*.

The above description is founded upon a specimen from Sagami Bay, Carnegie Museum Cat. of Fishes, No. 7760, measuring 344 mm. in length of body.

The specimen here dealt with agrees well with the original description of the species given by Döderlein.

The species closely resembles *S. purpurascens*, but differs from it in having the depth of the body decidedly lower than the length of the head; the eye comparatively large in comparison with the length of the body; the caudal peduncle as low as 1.4 in its length; the ventral inserted behind the base of the pectoral; and the caudal lobe equal to the head. Jordan, Tanaka, and Snyder have united this species with their *S. aureovittata*, which is not that of Temminck and Schlegel, but *S. quinqu radiata* of the latter. However, the present species undoubtedly differs from both *S. quinqu radiata* and *S. aureovittata* in the shape of the head, the extension of the maxillary, the number of the scales in the lateral line, the gill-rakers, and the pyloric cæca. Specimens from Hawaii described and figured by Günther as *S. dumerili* and described by Jordan and Evermann as *S. purpurascens* certainly belong to this species, as is known from the description and figure given by the former author, and from the description of the latter authors.

The species is distributed throughout the tropical and temperate zones of the Pacific. It is rather common upon the southernmost coasts of Japan proper.

Localities:—Sagami Bay; Amakusa; Ryūkyū.

SERIELINA Wakiya, gen. nov.

Gill-rakers transformed into knob-like masses, otherwise like *Seriola*. The genus is proposed with *Seriola intermedia* Temminck and Schlegel as the genotype. Only a single species is known from Japan.

67. *Seriolina intermedia* (Temminck and Schlegel).

(PL. XXXVIII, fig. 1.)

Seriola intermedia Temminck and Schlegel, 1844, p. 116.

D. VII-I, 32; A. O-I, 16; scales about 150; vert. 24 (11+13).

Head 3.2 in length of body (4 in total length); depth 3.2 (4); eye 5 in head; snout 3.5; maxillary 2.04; pectoral 1.75; ventral 1.25.

Body moderately compressed; dorsal profile of head rather strongly curved. Snout obtuse, longer than eye, three-fourths of interorbital

space. Maxillary extending beyond posterior border of pupil; its posterior end quite convex, very narrow; its breadth 5 in length. Gill-rakers transformed into knob-like masses. Depth of caudal peduncle 1.4 in length; keel on the sides scarcely developed. Spinous dorsal commencing a little behind anterior end of the base of pectoral; with seven spines, the last two very short, only their tips being visible; third spine the highest, 4.9 in head, nearly equal to eye, 2.9 in highest soft dorsal ray, which is 1.75 in head. Anal spine hidden under skin. Origin of soft anal behind middle of soft dorsal. Ventral inserted below posterior part of base of pectoral, longer than latter, 1.6 in distance between its insertion and origin of anal. Twenty pyloric cæca, the longest 2.66 in head.

Color in formalin brownish, with six blackish cross-bands; the first running back to middle of side, and thence backward; the last one above lateral line on caudal peduncle. Head darker above; opercle with a blackish blotch; preopercle, interopercle, and subopercle narrowly edged with white; spinous dorsal blackish; soft dorsal brownish, intruded upon by third, fourth, and fifth dark bands on side of the body; distal parts of the three anterior soft dorsal rays white; caudal brown, its outer and posterior margins white; pectoral pale; ventral brownish, becoming black distally.

The foregoing description is drawn from a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7761, measuring 156 mm. in length of body. Another specimen from Nagasaki, with the body 245 mm. long, has the snout equal to the interorbital space, the eye 5.5 in the head, and the ventral 1.85 in the distance between its insertion and the origin of the anal.

The specimens here dealt with quite agree with the original description of this species given by Temminck and Schlegel.

S. nigrofasciata (Rüppell) is nearly related to this species, but differs from it in having the depth higher than the length of the head, the ventral equal to the head, and the maxillary not extending beyond the center of the eye.

This species seems to be widely distributed in the warm seas of Japan proper, but it is not common.

Localities:—Kii; Nagasaki; Ryūkyū.

Genus NAUCRATES Rafinesque.

Spinous dorsal composed of a few free, short spines; no finlets behind soft dorsal and anal. Lateral line developed into a large fleshy keel on each side of the caudal peduncle.

Only a single species of this genus is known from Japan.

68. **Naucrates indicus** Cuvier and Valenciennes.

(PL. XXXVIII, fig. 2.)

Naucrates indicus Cuvier and Valenciennes, Vol. IX, 1833, p. 326.*Naucrates ductor* Günther, (*partim*), Cat. Fish. Brit. Mus. Vol. II, 1860, p. 374.

D. V (IV)-I, 28; A. II (O)-I, 16 or 17.

Head 3.87 in length of body (4.65 in total length); depth 3.8 (4.54); eye 6.14 in head; snout 3.07; pectoral 1.75; ventral 1.56.

Body scarcely compressed, subcylindrical in shape. Snout rather obtuse, much longer than eye, twice its diameter; maxillary reaching front border of eye; lower jaw equal to upper. Opercle striated. Lateral line somewhat wavy and scarcely curved anteriorly. Spinous dorsal with four (five in young) spines, weak, very short, not connected with membrane; height of soft dorsal a little lower than half of head, 2.1 in it; that of anal 2.53. Free anal spines not plainly visible in adult. Origin of soft anal commencing a little before middle of soft dorsal. Ventral inserted just below posterior end of base of pectoral, rather longer than latter; caudal lobe 3.6 in length of body.

Color in formalin dark brown above, lighter below, crossed with six darker ventral bands; fins brownish, except pectoral, which is light; tip of caudal lobes white; uppermost rays of pectoral blackish.

The foregoing description is founded upon a specimen from Kii, measuring 335 mm. in the length of body. The figure on the plate is drawn from a specimen from the same locality, Carnegie Museum Cat. of Fishes, No. 7762, measuring 135 mm. in the length of body. The younger specimen has a much lower body, a larger eye, a shorter caudal lobe, and the maxillary extending a little farther backward. The darker bands crossing the sides of the body become indistinct with age.

The specimens here dealt with quite agree with the original description of this species given by Cuvier and Valenciennes.

The species closely resembles *N. ductor*, but differs from it in having a less compressed body, a smaller eye, a more curved snout, the ventrals rather longer than the pectoral, and the caudal with white tips. Specimens from Japan listed by Steindachner and Döderlein and by Jordan, Tanaka, and Snyder as *N. ductor* would be this species.

The fish seems to be widely distributed throughout the Indian Ocean and the warm areas of the Pacific. In Japan proper its distribution extends as far northward as the Tsuruga Strait.

Localities:—Miyako; Kii; Nagasaki; Ryūkyū.

Genus ELAGATIS Bennett.

Spinous dorsal composed of several spines connected with membrane; a finlet composed of two rays behind soft dorsal and anal. Lateral line not developing into a keel on each side of caudal peduncle.

Only a single species of this genus is known.

69. *Elagatis bipinnulata* (Quoy and Gaimard).

(Pl. XXXVII, fig. 2.)

Seriola bipinnulata Quoy and Gaimard, Voyage Uranie, Zoöl., I, 1824, p. 363, pl. 61, fig. 3.

D. VI-I, 26-I; A. O (II)-I, 17-I; vert. 24 (10+14).

Head 3.66 in length of body (4.54 in total length); depth 4 (5); eye 5.84 in head; snout 3.15; pectoral 2.11; ventral 2.11.

Body a little compressed; shape fusiform; profiles equally turning from middle toward both ends rather rapidly and almost straight. Snout pointed, conical, about twice diameter of eye; maxillary not reaching front border of eye; lower jaw slightly longer than upper. Scales comparatively large. Lateral line slightly curving anteriorly. Spinous dorsal with six spines connected by membrane; highest spine 5.75 in head. Soft dorsal and anal pointed anteriorly; former 3 in head, latter 3.5. Free anal spines hidden under skin in adult. Pectoral equal to ventral; caudal lobes attenuated, upper lobe 1.3 times of head, somewhat longer than lower.

Color in formalin brown above, lighter below; spinous dorsal brown; ventral blackish; other fins gray; top of anal white; posterior margin of caudal darker. Body in life with two longitudinal blue bands; fins yellow, except dorsals.

The above description is based upon a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7763, measuring 278 mm. in length of body.

The species is widely distributed throughout all the warm seas of both hemispheres. It is found in the warm waters of Japan proper.

Localities:—Kii; Ryūkyū.

Subfamily SCOMBEROIDINÆ.

Body much compressed, oblong in shape, not much elevated at middle, head trenchant at top. Jaws equal; premaxillary not protractile, except in the very young. Teeth sharp, present on jaws, vomer, palatines, and tongue. Gill-rakers normal in shape. Scales rudimentary, transformed into linear dermal products imbedded in the skin. Lateral line slightly curving anteriorly, not armed with scutes, nor developed into a keel on each side of the caudal peduncle. Spinous

dorsal composed of a few, short, free spines; soft dorsal and anal not falcate anteriorly; anal equal to soft dorsal, much longer than abdomen; posterior rays of dorsal and anal semi-detached, forming finlets. Pectoral short, not pointed; ventrals also short, depressible in a deep median groove on abdomen.

Three genera compose this family, but only one of them is known from Japan.

Genus SCOMBEROIDES Lacépède.

Maxillary with supplemental bone; teeth subequal; spines of spinous dorsal seven in number.

Five species of this genus are known from Japanese waters.

- a. Maxillary not extending beyond posterior border of eye.
- b. Scales linear, pointed at both ends; teeth of upper jaw in a single series on side.
- c. Sides of body with a series of darker spots.
- d. Head equal to depth of body; curved portion of lateral line making an obtuse angle over middle of pectoral. *sancti-petri*.
- dd. Head shorter than depth of body; curved portion of lateral line not making an angle over middle of pectoral. *moadetta*.
- cc. Side of body without a series of darker spots. *formosanus*.
- bb. Scales lanceolate, rounded behind; teeth of upper jaw in a narrow band; no spots on side of body. *orientalis*.
- aa. Maxillary extending far beyond posterior border of eye. *lysan*.

70. *Scomberoides sancti-petri* (Cuvier and Valenciennes).

Chorinemus sancti-petri Cuvier and Valenciennes, Vol. VIII, 1831, p. 38.—
Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 473.

D. VII-I, 21; A. II-I, 19.

Head 4.82 in length of body (5.73 in total length); depth 4.7 (5.6); eye 5.6 in head; snout 3.36; pectoral 2; ventral 2.

Snout pointed, much longer than eye. Maxillary widened posteriorly, extending to posterior border of pupil. Teeth of upper jaw in a band on front and in a single series on sides; those of lower in two series on sides, of which the outer ones are somewhat finer than the inner, and bending a little forward. Scales linear, pointed at both ends. Lateral line somewhat wavy, its curved portion making

an obtuse angle above middle of pectoral. First spine of spinous dorsal two-thirds of second spine. Ventral short, 1.88 in distance between its insertion and origin of anal.

Color in formalin brownish above, light below; a series of ten blackish spots on sides of body, of which the anterior ones are set rather closely on the curved portion of the lateral line, and the remaining rather distantly above the straight portion; greatest diameter of largest spot equal to that of eye; dorsal and caudal gray; anal and paired fins light; top of soft dorsal and of anal blackish.

The above description is based upon a specimen from Ryūkyū, Carnegie Museum Cat. of Fishes, No. 7764, measuring 400 mm. in length of body.

The specimen here dealt with agrees with quite closely with the original description of this species.

S. sancti-petri is widely distributed throughout the Indian Ocean and the tropical areas of the Pacific. It is not known from Japan proper.

Localities.—Ryūkyū; Formosa.

71. *Scomberoides moadetta* (Cuvier and Valenciennes).

(Pl. XXXVII, fig. 3.)

Chorinemus moadetta Cuvier and Valenciennes, Vol. VIII, 1831, p. 382.

Chorinemus sancti-petri Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 473.

Scomberoides moadetta Seno, Report on Fishery Industry of Formosa, 1910, p. 119.

D. VII-I, 21; A. II-I, 19.

Head 4.86 in length of body (5.75 in total length); depth 4.23 (5); eye 5.3 in head; snout 3.53; pectoral 2; ventral 2.2.

Snout pointed, much longer than eye. Maxillary rather widened posteriorly, extending to center of eye. Teeth of upper jaw in a narrow band on front, and in a single series on sides; those of lower in two series on sides, of which the outer ones are finer than the inner. Scales linear, pointed at both ends. Lateral line not wavy, and curved portion not making an angle above middle of pectoral. First spine of spinous dorsal two-thirds of second spine. Ventral short, 2.26 in distance between its base and origin of anal.

Color in formalin brown above, lighter below; a series of ten blackish oblong spots above lateral line; greatest diameter of largest spot somewhat more than that of pupil; dorsal and caudal gray; top of soft dorsal black; anal and paired fins pale.

The foregoing description is drawn from a specimen from Formosa, measuring 285 mm. in the length of body.

The specimens examined quite agree with the original description of this species by Cuvier and Valenciennes.²⁷

The species closely resembles *S. sancti-petri*, but differs from it in having the head shorter than the depth of the body, and the curved portion of the lateral line not making an angle above the middle of the pectoral, and in having much smaller spots on the curved portion of the lateral line, and the anal not tipped with black.

The species is widely distributed throughout the Indian Ocean and the tropical areas of the Pacific. It is not known from Japan proper.

Locality:—Formosa.

72. *Scomberoides formosanus* Wakiya, sp. nov.

(PL. XXXVIII, fig. 3.)

Scomberoides orientalis Jordan and Evermann, (*non* Temminck and Schlegel), Proc. U. S. Nat. Mus., Vol. XXV., 1903, p. 336.

Scomberoides tol Jordan and Richardson, (*non* Cuvier and Valenciennes), Memoirs Carnegie Museum, Vol. IV, 1909, p. 178.

D. VII-I, 20; A. II-I, 18.

Head 4.8 in length of body (5.6 in total length); depth 4 (4.6); eye 4.3 in head; snout 3.5; pectoral 1.75; ventral 2.

Snout pointed, longer than eye. Maxillary extending to posterior border of pupil. Teeth on upper jaw in a single series rather widely spread; those of lower jaw in two series, the inner ones of which are somewhat curved inwardly. Scales linear, pointed at both ends. Curved portion of lateral line wavy, making an obtuse angle above middle of pectoral. First dorsal spine a little shorter than half of second spine. Ventral short, 1.7 in distance between its base and origin of anal, its tip falling far forward from anus.

Color in formalin brown above, light below; no black spots on body and fins. The above description is that of the type, a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7765, measuring 130 mm. in length of body.

The species resembles both *S. sancti-petri* and *S. moadetta* in the shape of the scales, but differs from them in having no black spots on the body and the fins, rather less numerous rays in the soft dorsal and the anal, and a narrower maxillary. A specimen from Formosa, identified by Jordan and Evermann as *S. orientalis*, and which afterwards was named *S. tol* by Jordan and Richardson, has, according to the note given by Jordan and Evermann, the depth of the body equal

²⁷No specimen of this species was sent by Dr. Wakiya to the Carnegie Museum.
A. W. HENN.

to only one-fourth of its length, and thus it distinctly differs from *S. orientalis* in which the depth of the body is much greater, being one-third of its length. Moreover, the maxillary of their specimen reaches to the posterior border of the pupil, whereas that of *S. tol* reaches only the anterior margin of the eye. Besides other differences, these two factors alone make it possible that their specimen does not represent either *S. orientalis* T. and S., or *S. tol* C. and V. As, however, the present species is the only one in which the peculiarities attributed by Jordan and Evermann to their *S. orientalis* (*S. tol*) occur, the writer may with all probability regard the form dealt with by Jordan and Evermann and by Jordan and Richardson as being identical with the present species.²⁸

The species is distributed throughout the warm waters of the Japanese Empire, but it is rare in Japan proper.

Localities:—Kii; Formosa.

73. *Scomberoides orientalis* (Temminck and Schlegel).

(PL. XXXVIII, fig. 4.)

Chorinemus orientalis Temminck and Schlegel, 1844, p. 106, pl. 57, fig. 1 (*poor*).

D. VII-I, 20; A. II-I, 18.

Head 4.33 in length of body (5.3 in total length); depth 3.5 (4.33); eye 4 in head; snout 3.6; pectoral 1.6; ventral 1.83.

Snout rather pointed, rather longer than eye. Maxillary extending to posterior border of eye, but scarcely to posterior of pupil in young stages. Teeth on upper jaw in a narrow band; those of lower in two series, of which the outer ones are set very close, and bend horizontally outward. Scales lanceolate, rounded posteriorly. Curved portion of lateral line somewhat wavy, making an obtuse angle above middle of pectoral. First dorsal spine very small, much shorter than half of second, about one-fifth diameter of eye. Ventral extending just to anus, 1.35 in distance between its base and origin of anal.

Color in formalin brown above, light below; dorsals gray; top of soft dorsal black; lobes of caudal blackish; anal and paired fins pale.

The foregoing description is based upon a specimen from Kii, Carnegie Museum Cat. of Fishes, No. 7766, measuring 125 mm. in the length of the body.

²⁸The inadequate description of early writers together with the large variations due to age, render identifications of species in this group difficult and uncertain.
D. S. JORDAN.

The specimens examined agree well with the original description of the species given by Temminck and Schlegel, and are so closely allied to *S. mauritianus* Cuvier and Valenciennes that it is difficult to point out the differences between them, except by comparison of the dentition of the two species. Among the distinctive characters of *S. mauritianus* attention may be called to the shortness of the two anterior dorsal spines and the extension of the hind end of the maxillary to the posterior border of the eye. The figure which accompanies the description of Temminck and Schlegel, however, shows a relatively long first dorsal spine equalling the diameter of the eye, and the maxillary scarcely reaching the posterior border of the pupil, characters which thus differ from those of *S. mauritianus*. Temminck and Schlegel state that the species they describe is the only one occurring rather commonly in the seas of the warmer parts of Japan. As, however, no fish with such a long first dorsal spine and such a short maxillary as their figure shows has ever been observed by the writer (although forms coinciding with the description they give, excepting the last mentioned characters, are somewhat common) it is perhaps allowable to infer that some error was made in the figure given by these authors. Assuming this, the present species may be looked upon as nothing more than *S. orientalis* Temminck and Schlegel.

The species is distributed throughout the warmer seas of Japan and abounds especially in the Bonin Islands, Ryūkyū, and Formosa.

Localities:—Kii; Uwajima; Nagasaki; Bonin Islands; Ryūkyū; Formosa.

74. *Scomberoides lysan* (Forskål).

Scomber lysan Forskål, 1775, No. 67, pl. 54.

Lychia lysan Rüppell, Atlant. Fische, 1828, p. 91.

Chorinemus lysan Günther, (*partim*), Cat. Fish. Brit. Mus., Vol. II, 1860, p. 471.

D. VIII-I, 20; A. II-I, 18.

Head 4.6 in length of body (5.53 in total length); depth 3.15 (3.8); eye 5.35 in head; snout 4.7; pectoral 1.53; ventral 1.78.

Snout obtuse, equal to eye, or nearly so. Maxillary very long, 1.8 in head, much widened posteriorly, extending far beyond posterior border of eye. Teeth of upper jaw in a band on front, and in a single series at sides; those of lower jaw in a band on front, with two pairs of distinct canines at tip of mandible, and in two series on sides, of which the outer are stronger than the inner, and bending a little forward. Scales lanceolate, those on lower half of body not quite

imbedded. Curved portion of lateral line making two obtuse angles; one above middle of pectoral, the other over the tip of the same fin. First dorsal spine short, one-third of second, which is a little shorter than half of eye. Ventral comparatively long, extending far beyond anus.

Color in formalin brownish; a series of eight large round darker spots present above lateral line; size of largest spots equal to diameter of eye; all fins pale, except posterior margin of caudal, which is darker.

The foregoing description is based upon a specimen from Formosa, Carnegie Museum Cat. of Fishes, No. 7768, measuring 345 mm. in length of body.

The specimen here dealt with accords well with the figure of this species given by Forskål, and quite well with the descriptions given by Rüppell and by Günther. The species closely resembles *S. commersonianus* (Lacépède), but differs in having a shorter head, a longer maxillary, and a series of blackish spots on the body. *S. commersonianus* has the head 5 in total length, the maxillary not extending beyond posterior border of eye, and is without a series of dark spots upon the body.

The species is widely distributed throughout the Indian Ocean and the tropical areas of the Pacific. It is not known from Japan proper.

Locality:—Formosa.

OBSERVATIONS.

It will, I think, be granted that the foregoing pages contain a review of almost all of the carangoid fishes which up to the present time are known to exist in the waters of the Japanese Empire. It should, however, be observed that, beside the seventy-four species hereinbefore listed, there are two species of the group, which are stated to occur in Japan, which I have omitted. The first was reported by Jordan and Snyder under the name *Trachynotus ovatus*, from Formosa, also listed by Jordan, Tanaka, and Snyder as occurring in the southern seas of Japan; the second species was reported by Jordan and Richardson under the name *T. russelli* from Formosa. Since both of these species are identified by certain ichthyologists with other species of the genus *Trachynotus*, and as Dr. Jordan and his collaborators merely listed them, the writer at present hesitates to include them among the carangoid fishes of Japan.

Of the seventy-four species, listed in the foregoing pages as occurring in Japanese waters, fifty-eight, or over seventy-seven per cent. are common also to the Indo-Pacific Region, excluding the coastal waters of western America. Six species, so far as is now known, are confined to the immediate region of Japan proper and the waters of the northern parts of eastern continental Asia, while ten species are found in the subtropical seas of Japan, but have not as yet been reported from the seas southward. Only one species, *Elagatis bipinnulata*, is also found in the Atlantic; none of the species are found in the Mediterranean; and probably none of them occur along the western coasts of America. Of the fifty-eight species common to Japanese waters and the Indo-Pacific region nineteen also occur in the Red Sea, where in all twenty-six species of carangoid fishes are known to exist; sixteen species about Hawaii, where twenty-five Carangoids are found; twenty-two about Samoa, where forty-eight species of Carangoids have been collected.

Of the sixteen species, which are as yet only known from Japanese waters, eight belong to types found in comparatively warm seas, and are rare about Japan proper and the subtropical waters of its southern extremity and the islands to the south. This fact goes to prove that the center of distribution of these forms lies to the south of Japan. When the carangoid fishes of the Indo-Pacific Region are more thoroughly investigated, species common to that region and the seas of Japan may probably be found to be more numerous, and those peculiar to Japanese waters may be found to be fewer in number, than we at present suppose. Taking all the circumstances into consideration the carangoid fishes of Japan must be regarded as forming a part of the Indo-Pacific fauna.

The fishes reported upon in the foregoing paper may be classified in groups according to their habitat, as follows:

- a. Sixty-seven species found in the Subtropical District, which comprises the Bonin Islands, Ryūkyū, and Formosa.
- b. Forty-five species found in the seas of Southern Japan proper, *i.e.*, from Nagasaki Bay around the southern coast of Kyūsyū as far north as the Bay of Tōkyō.
- c. Ten species found in the seas of Northern Japan proper, *i.e.*, from Nagasaki Bay northward in the Sea of Japan to the Strait of Tsugaru, and thence southward along the eastern coast as far as the Bay of Tōkyō.

d. Two species found in the Subarctic District of Japan, *i.e.*, Hokkaidō, Sakhalin, and the Kuriles.

e. Five species found in the Korean District.

If we now consider these districts somewhat more closely, we find in the first, or Subtropical District (a), a confirmation of the opinion we have expressed that the carangoid fishes of Japan form a part of the Indo-Pacific fauna. Not only are the species more numerous in this district but also all the genera occurring in it are found throughout the Indo-Pacific Region. Of the sixty-seven species of the *Carangidae* occurring in the district fifty-eight, or eighty-six per cent., also occur in the Indo-Pacific area. The majority of the remaining eight species are likely with future exploration to be found to occur in the Indo-Pacific also.

In the second district covering the seas of southern Japan proper (b), which fairly corresponds with "The Japanese District" of Günther, the carangoid fauna shows some difference from that of the Subtropical District (a). In this district we have *Trachurus japonicus*, *Decapterus muroadsi*, *D. maruadsi*, *Caranx delicatissimus*, *Seriola quinqueradiata*, *S. aureovittata*, and *S. purpurascens*, which are peculiar to the waters of Japan proper and the opposite shores of the Asiatic Continent. Furthermore, the number of the species in the genera *Decapterus*, *Caranx*, *Scomberoides*, and *Trachynotus* is here greatly reduced. The genus *Atropus* with its single species wholly disappears, and the entire number of species only amounts to about three-fourths that of the Subtropical District. Nevertheless all of the genera of the family in this district and sixty-two per cent. of the species found here are common to the Indo-Pacific Region. This fact manifestly shows that the carangoid fishes of this district are a part of the Indo-Pacific fauna.

In the third district, the seas of northern Japan proper (c), five genera, *Selar*, *Alectis*, *Elagatis*, *Megalaspis*, and *Scomberoides*, as well as almost all of the Indo-Pacific species of the genera *Trachurus*, *Decapterus*, and *Caranx* disappear. The number of species occurring in this district is very small, the only two species which range northward beyond the Strait of Tsugaru, being *Trachurus japonicus* and *Seriola quinqueradiata*. In the distribution of the carangoid fishes in this district it is especially noteworthy that the number of species becomes considerably smaller along the eastern or Pacific coast than on the western or Japan Sea coast as we proceed northward. This

phenomenon is not restricted only to the *Carangidæ*, but the same is true of all tropical and subtropical fishes. In the opinion of the writer the reason for this fact is that on the Pacific side of Japan the warm current, the "Kurosiwo," or "Black Stream," runs close inshore as far as the Bay of Tōkyō, whence it trends outwardly into the Pacific Ocean, and runs eastwardly, while its counter-current, the "Oyasiwo," brings the cold water down from Bering Straits, reaching the Inube promontory at the northern entrance of the Bay of Tōkyō. This prevents the distribution of fishes of a tropical type from spreading to the north of the Bay of Tōkyō. On the contrary in the Japan Sea the cold current from the Sea of Okhotsk, the Liman Current, runs close inshore along the Asiatic mainland, and does not prevent the flow of the warm from the south, which, although much feebler than the Black Stream, pours uninterruptedly along the western coasts of Japan proper northwards, until it mixes with the cold water along the western coasts of the Hokkaidō.

In the fourth, or Subarctic District, (d), two species of the *Carangidæ*, *Trachurus japonicus* and *Seriola quinqueradiata* are known from the northwestern coast of the Hokkaidō (Yeso), and the latter only from the southernmost extremity of Sakhalin. No other carangoid fishes occur in this district.

In the Korean District, (e), only a few species are known from the coasts of the Japan and Yellow Seas. In the Japan Sea this is perhaps owing to the low temperature of the water, produced by the inshore flow of the cold current from the north; and in the Yellow Sea owing to the muddy water, unsuited to the life of carangoid fishes. At the southernmost extremity of the Korean District, where no thorough search for carangoid fishes has as yet been made, it is possible that more species may turn up as the result of future investigations. The marine conditions at this point more closely resemble those at Nagasaki and vicinity on the opposite side of the Yellow Sea.

Now let us take up the question of the barriers which separate the fauna of the Indo-Pacific from tropical and subtropical regions of the Atlantic Ocean. Günther believed in the occurrence of a much greater number of identical genera and even of identical species in the Mediterranean and the waters of southern Japan proper, his "Japanese District," than we do. He therefore asserts that "The Mediterranean and Japanese seas were in direct and open communication with each other within the period of the existence of the present

Teleostean fauna." According to this view continuous communication must have existed between the Mediterranean and those parts of the Pacific surrounding Japan. It has been suggested that this communication may have been by a passage where now is located the Isthmus of Suez. Ortmann and others are inclined to think that such a line of communication did not exist where the Isthmus of Suez now is, but further north, probably through some part of Siberia. It is alleged that such a communication must have existed during the Eocene. Great changes have occurred both in the crust and the climate of the earth since that time and the fish fauna of the Mediterranean of the Eocene and the fish fauna of the Mediterranean of today surely differ. A connection at the time of the Eocene, if such a connection really existed, fails entirely to explain the similarity, or rather dissimilarity, which exists between the two faunæ at the present time. Jordan and Evermann, after stating that the number of the genera common to Japanese waters and the Mediterranean is not much greater than the number common to Japan and the West Indies or the Pacific coasts of North America and Mexico, or Japan and Australia, go on to mention the existence of several autochthonous genera existing separately in both seas. They attribute the similarities between the widely separated faunæ to like conditions, rather than to direct communication between them. Furthermore they (or perhaps Dr. Jordan alone, as in the discussion in this part of their work the nominative "I" is used instead of "we") state, that, since the fauna of the Red Sea is essentially Indian in respect to the genera, it is much the same as that of southern Japan. But the Mediterranean fauna is the same as that of the warm Atlantic, and the number of genera common to the Red Sea and the Mediterranean is very small. The facts known as to the distribution of fishes in these two bodies of water do not therefore go to prove the recent submergence of the Isthmus of Suez. Even if, as shown on recognized geological maps, such a submergence took place in Pliocene and Postpliocene times, the resultant channel must have been shallow and muddy, and the salinity of the water, judging from the flow of the Nile, must have been very low. Only fishes living in brackish water could have migrated through the passage. Even if we admit the former existence of such a shallow channel, the influence of the Isthmus of Suez as a barrier separating the faunæ of the Mediterranean and the Indian Ocean must have been very great.

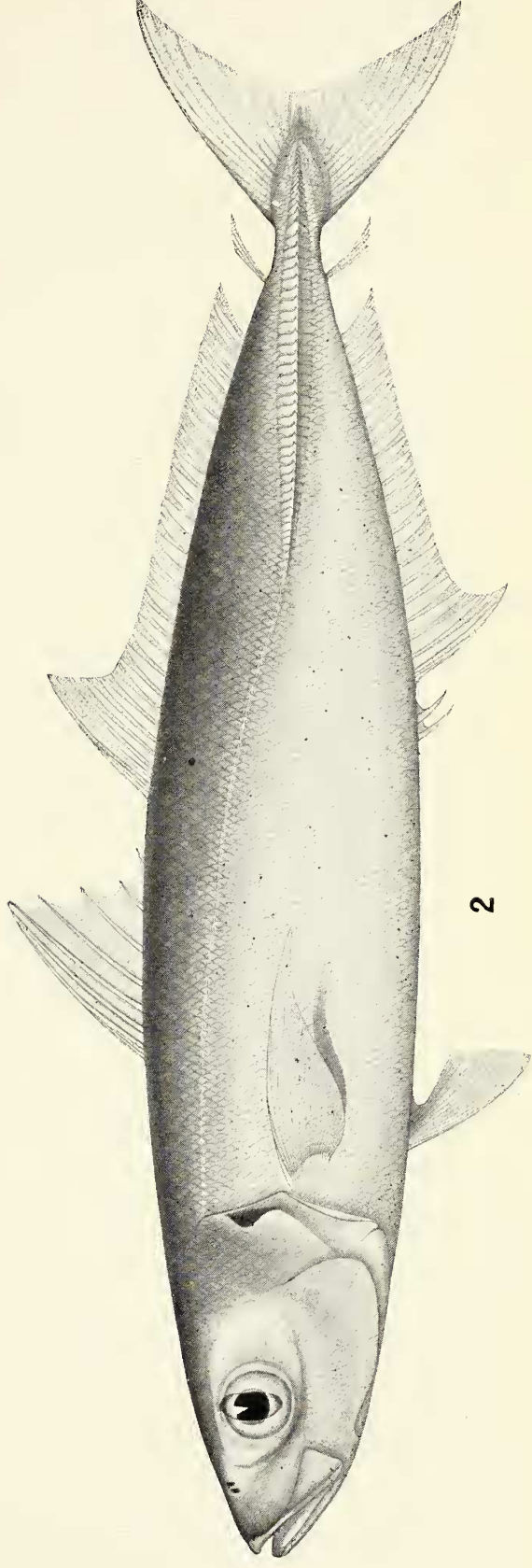
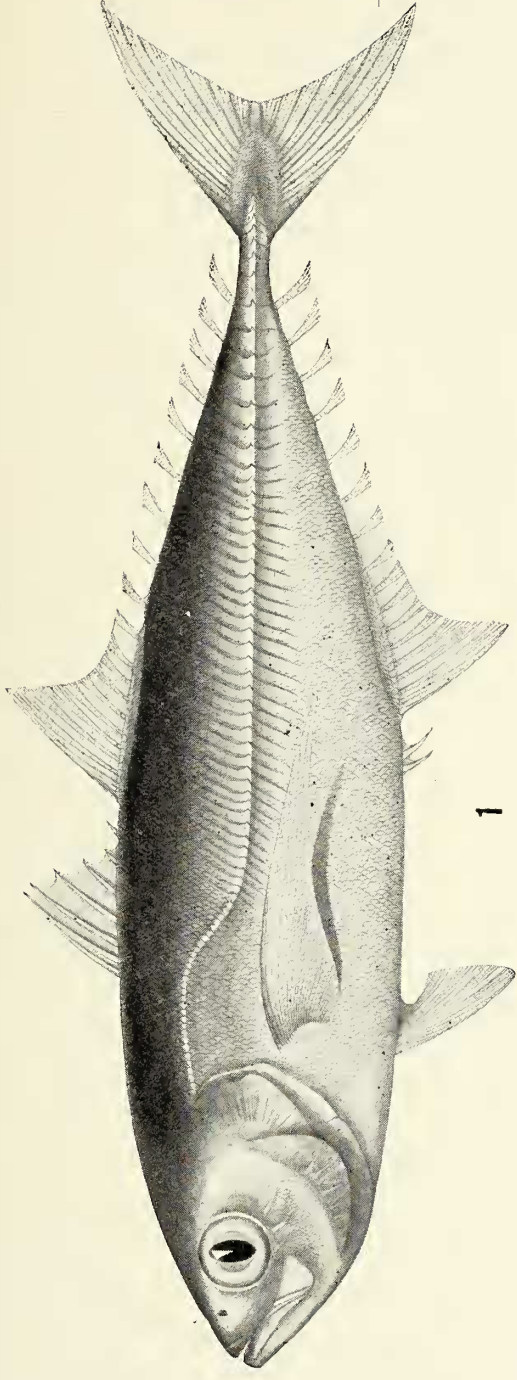
The study given by the writer to the species of carangoid fishes forming the fauna of Japan, of the Red Sea, and of the Mediterranean, leads him to agree with the conclusions of Jordan and Evermann. Of the forty-five species of carangoid fishes ascribed to the waters of southern Japan proper, nine are also found in the Red Sea, eleven in Hawaii, and ten around Samoa, while not a single one of these species is found in the Mediterranean. This fact alone proves the untenability of the hypothesis of an open and direct communication between the waters of Japan and those of the Mediterranean in recent geologic time. Moreover, out of twenty-five species known to occur in the Red Sea, nineteen, or seventy-three per cent., are common to Japan, and nine, or thirty-five per cent., are common even to southern Japan proper, while not a single one of these species occurs in the Mediterranean. These facts can only be explained upon the assumption that the barrier formed by the Isthmus of Suez checked the intermingling of the fishes, at least of the carangoid fishes, of the Red Sea and the Mediterranean, during the evolution of the faunæ of these two seas. The ten Atlantic species of carangoid fishes, which have been reported by some previous authors as also occurring in the Indo-Pacific Region, therein including Japan, such as *Trachurus trachurus*, *Decapterus sanctæ-helenæ*, *Selar crumenophthalmus*, *Caranx hippos*, *C. latus*, *C. lugubris*, *Seriola lalandi*, *S. dumerili*, *Naucrates ductor*, and *Elagatis bipinnulata*, with the single exception of the last-mentioned species do not exist in Japanese waters. The same remark applies to other carangoids reported from other areas of the Indo-Pacific region, so far as it is possible to reach conclusions from the literature. The fewness of the forms of *Carangidæ* which are common to the Atlantic and to the Indo-Pacific Region suggests that the same scarcity of common forms may also occur in other groups which are pelagic or semipelagic. Should this generalization ultimately be found to be true, we may ascribe this peculiarity of distribution simply to the fact that the cold Atlantic current, flowing northward along the southwestern coast of Africa, the Benguela Stream, and the main westward drift flowing off from the continent form the barrier which separates the present fish fauna of the Indo-Pacific from that of the warm Atlantic, just as the cold current which washes the southern end of the continent of South America checks the mingling of the fishes between the Pacific and the Atlantic, or as the Isthmus of Suez acts as a barrier between the Mediterranean and the Red Sea.

PLATE XV.

FIG. 1. *Megalaspis cordyla* (Linnæus). Formosa. C. M. Cat. No. 7705.
215 mm. to base of caudal.

FIG. 2. *Decapterus russelli* (Rüppell). Tōkyō Bay. C. M. Cat. No. 7706.
290 mm. to base of caudal.

(Figures one-half natural size)



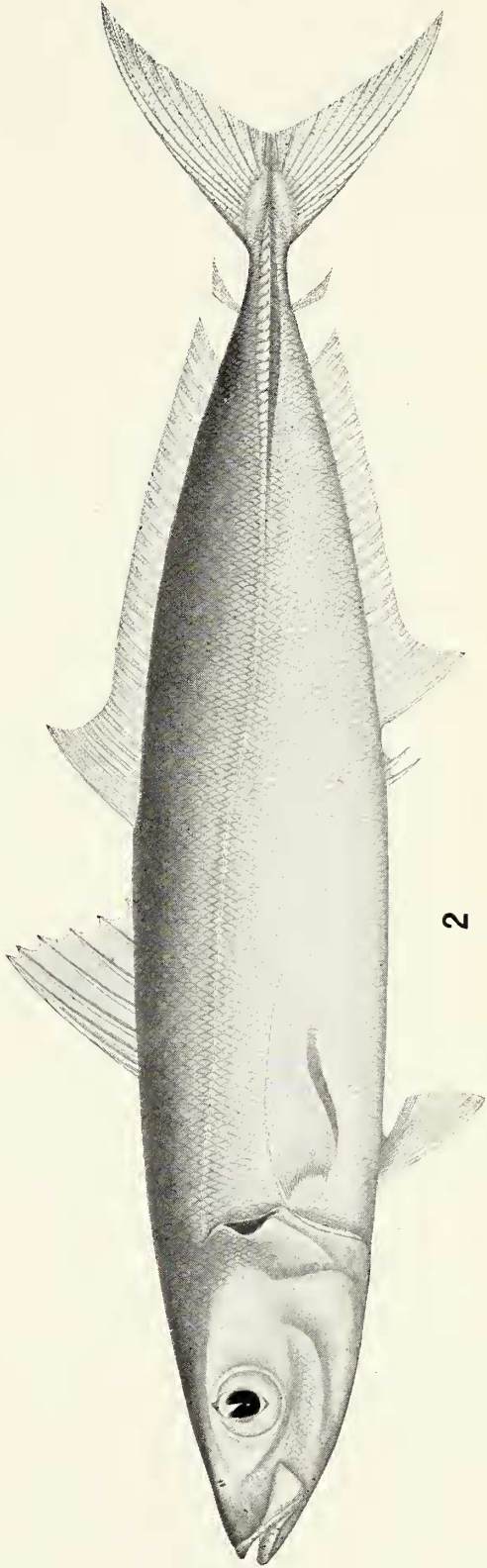
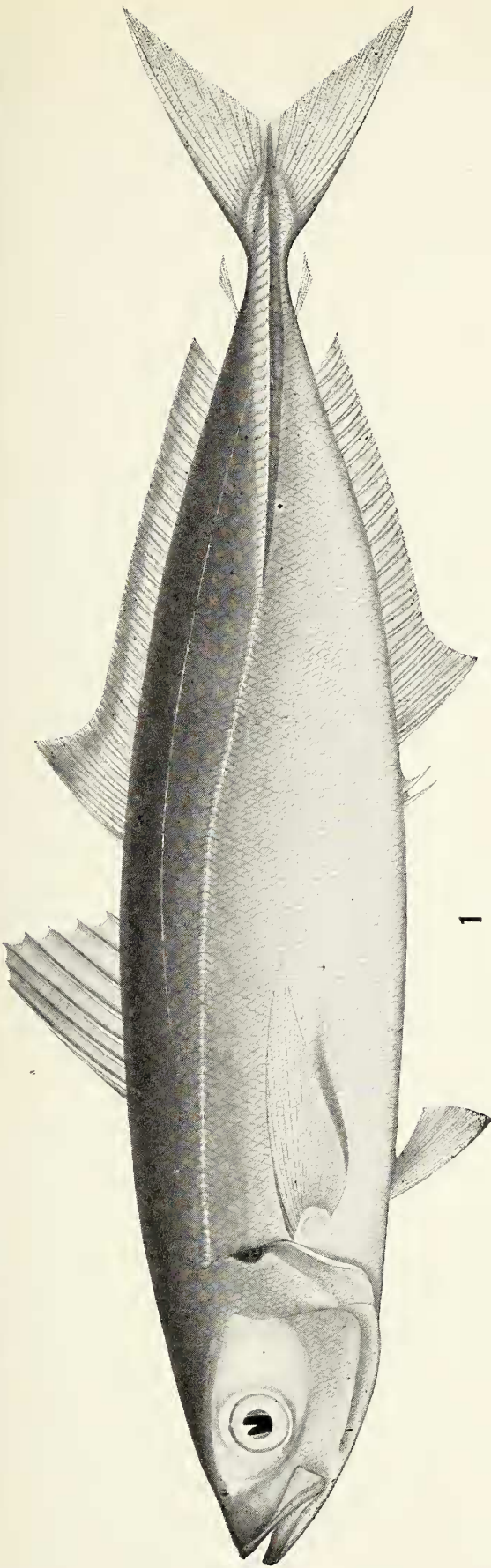
Megalaspis and Decapterus.

PLATE XVI.

FIG. 1. *Decapterus muroadsi* (Temminck and Schlegel). Kii. C. M. Cat. No. 7707, 260 mm. to base of caudal.

FIG. 2. *Decapterus macrosoma* Bleeker. Bonin Islands. 248 mm. to base of caudal. (Species represented in C. M. by No. 7708, 214 mm. in length of body).

(Figures one-half natural size)



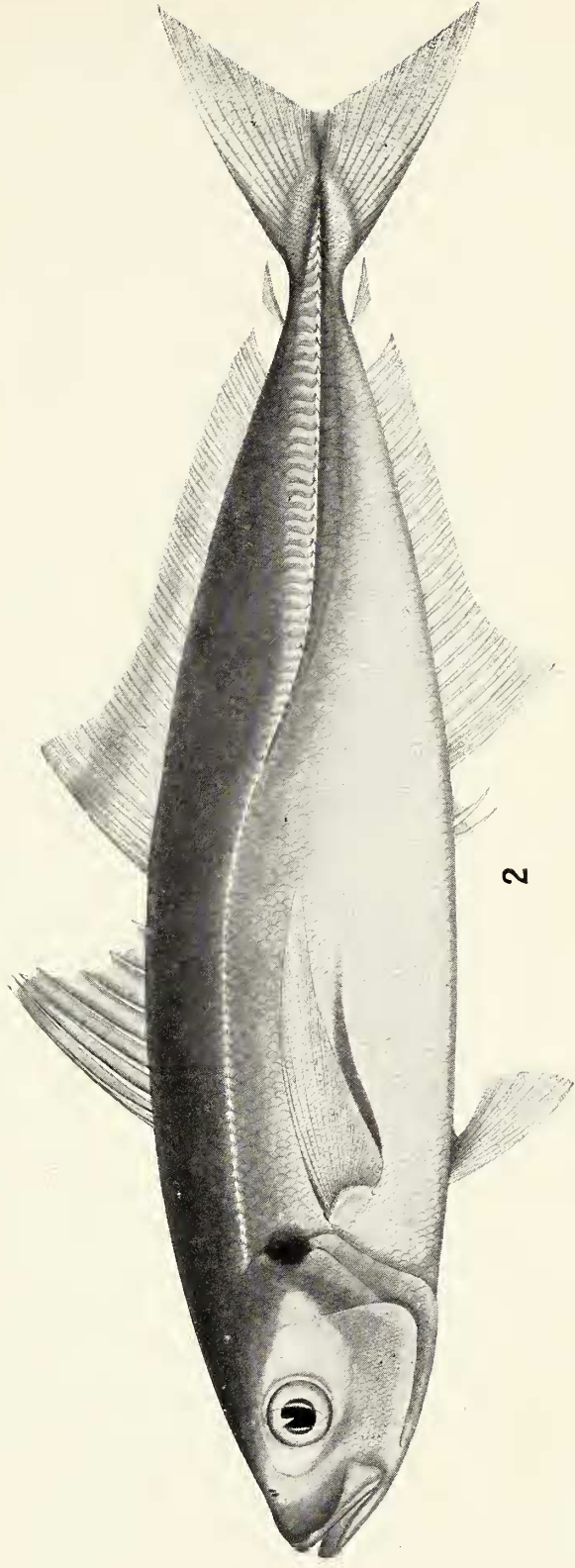
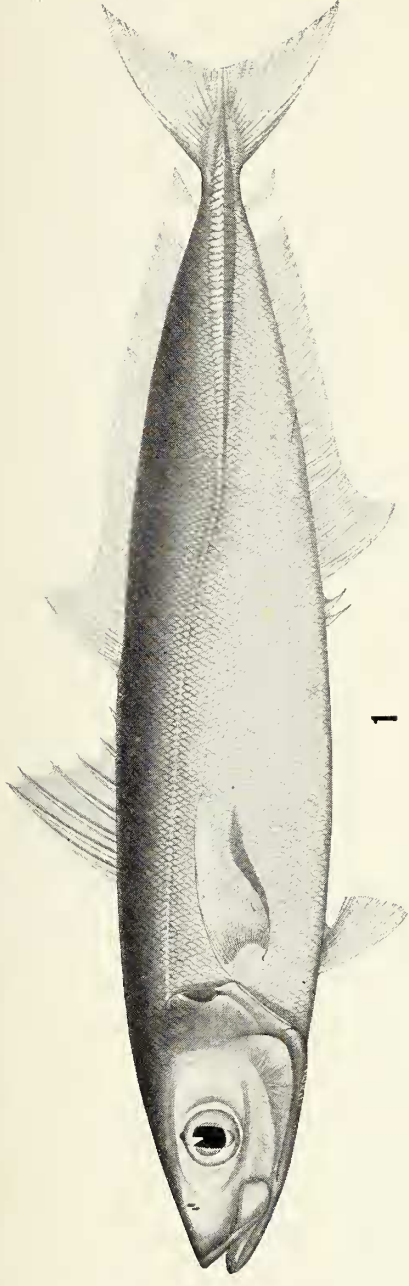
Decapterus.

PLATE XVII.

FIG. 1. *Decapterus lajang* Bleeker. Kii. 204 mm. to base of caudal. (Species represented in C. M. by No. 7709, 260 mm. to base of caudal).

FIG. 2. *Decapterus maruadsi* (Temminck and Schlegel). Kii. C. M. Cat. No. 7710. 247 mm. to base of caudal.

(Figures one-half natural size)



Decapterus.

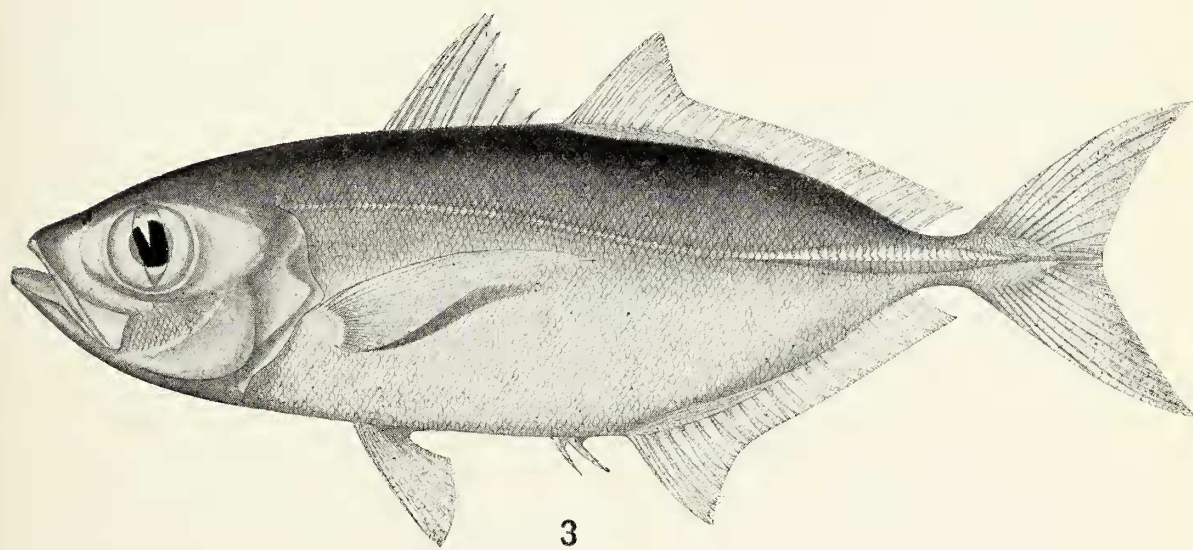
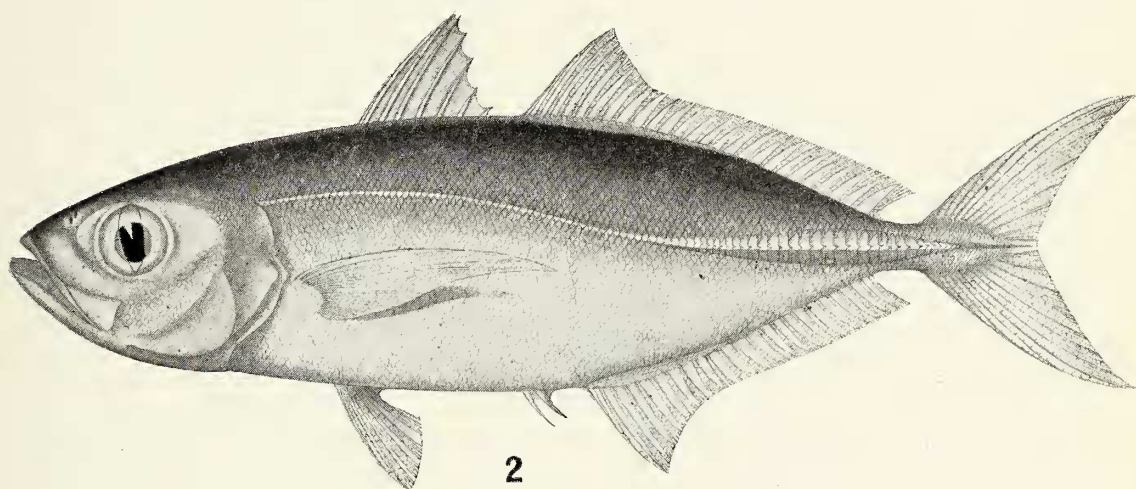
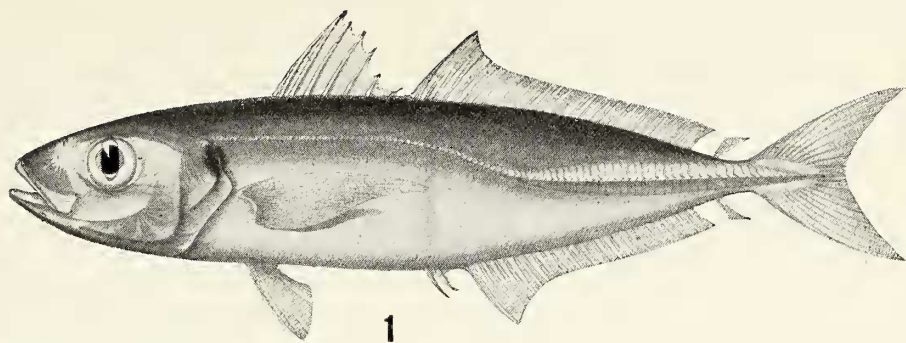
PLATE XVIII.

FIG. 1. *Decapterus dayi* Wakiya, sp. nov. Type. Formosa. C. M. No. 7711. 140 mm. to base of caudal.

FIG. 2. *Selar mauritianus* (Quoy and Gaimard). Kii. C. M. No. 7712. 177 mm. to base of caudal.

FIG. 3. *Selar macrophthalmus* (Rüppell). Bonin Islands. C. M. No. 7713. 175 mm. to base of caudal.

(All figures one-half natural size)



Decapierus and *Selar*.

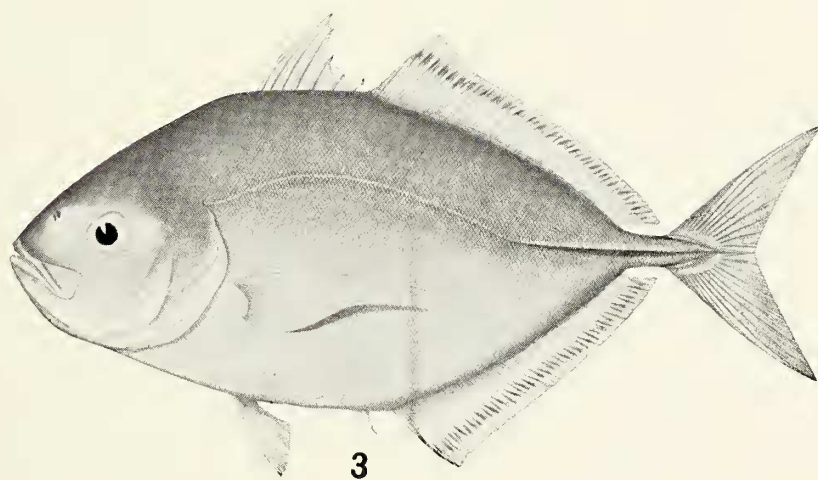
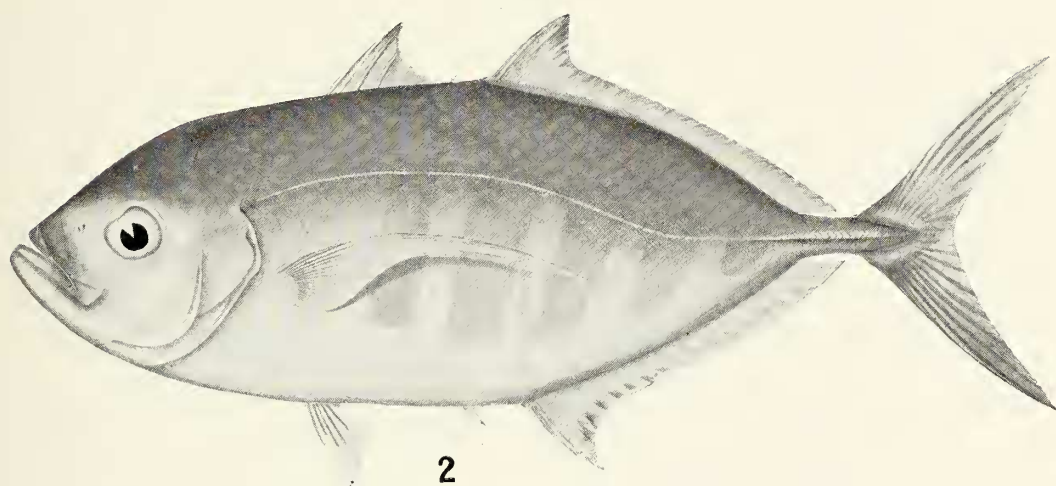
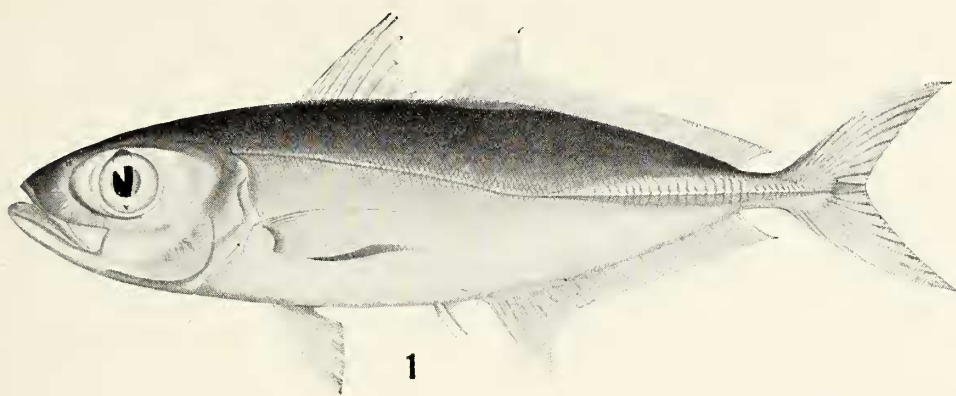
PLATE XIX.

FIG. 1. *Selar torvus* (Jenyns). Bonin Islands. C. M. No. 7714. 218 mm. to base of caudal.

FIG. 2. *Caranx* (*Carangoides*) *ferdau* (Forskål). Ryūkyū. C. M. No. 7715. 240 mm. to base of caudal.

FIG. 3. *Caranx* (*Carangoides*) *equula* Temminck and Schlegel. Tōkyō Bay. C. M. No. 7716. 195 mm. to base of caudal.

(All figures one-third natural size)



Trachurops and *Caranx*.

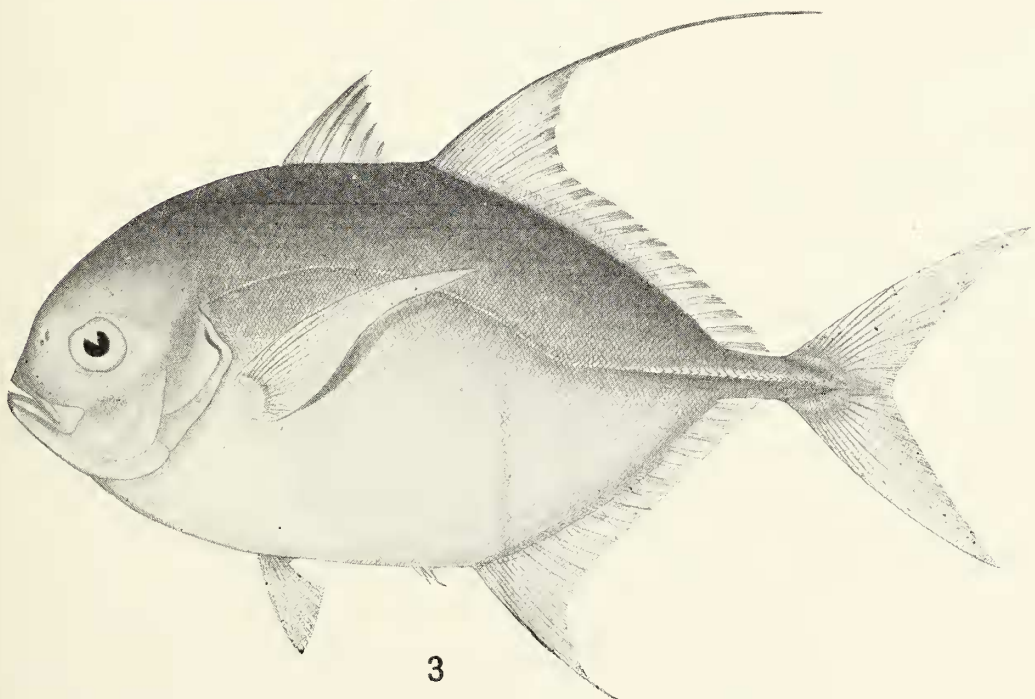
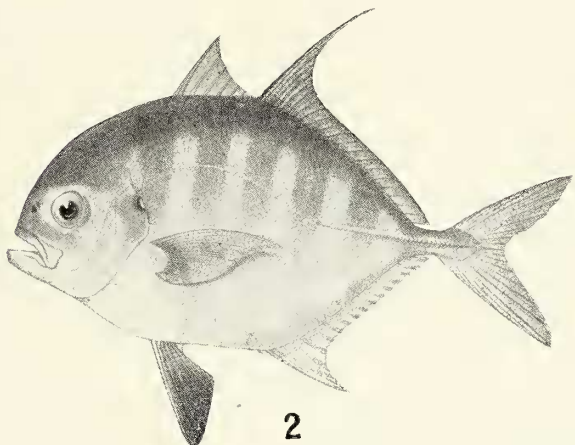
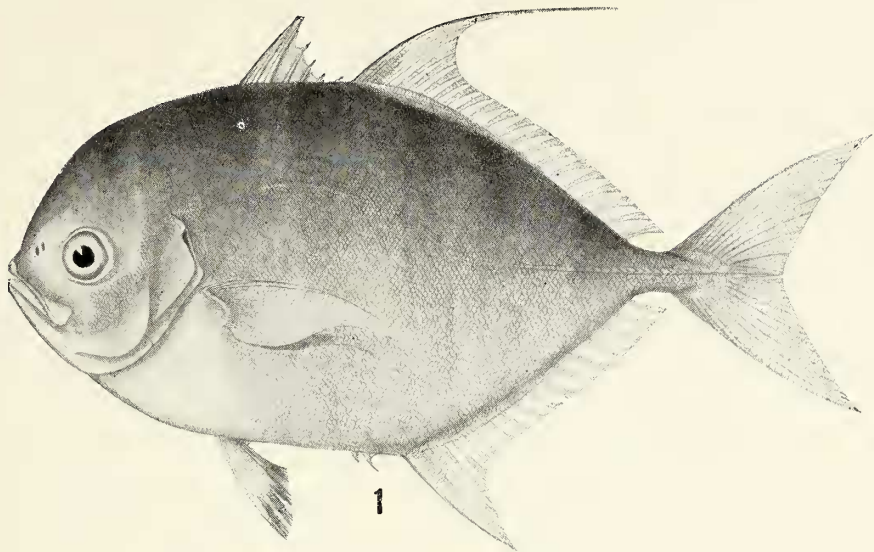
PLATE XX.

FIG. 1. *Caranx (Citula) armatus* (Forskål). Formosa. 123 mm. to base of caudal.

FIG. 2. *Caranx (Citula) schlegeli* Wakiya, *nom. nov.* Nagasaki. C. M. No. 7717. 77 mm. to base of caudal.

FIG. 3. *Caranx (Citula) plumbeus* (Quoy and Gaimard). Kii. C. M. No. 7718. 144 mm. to base of caudal.

(All figures one-half natural size)

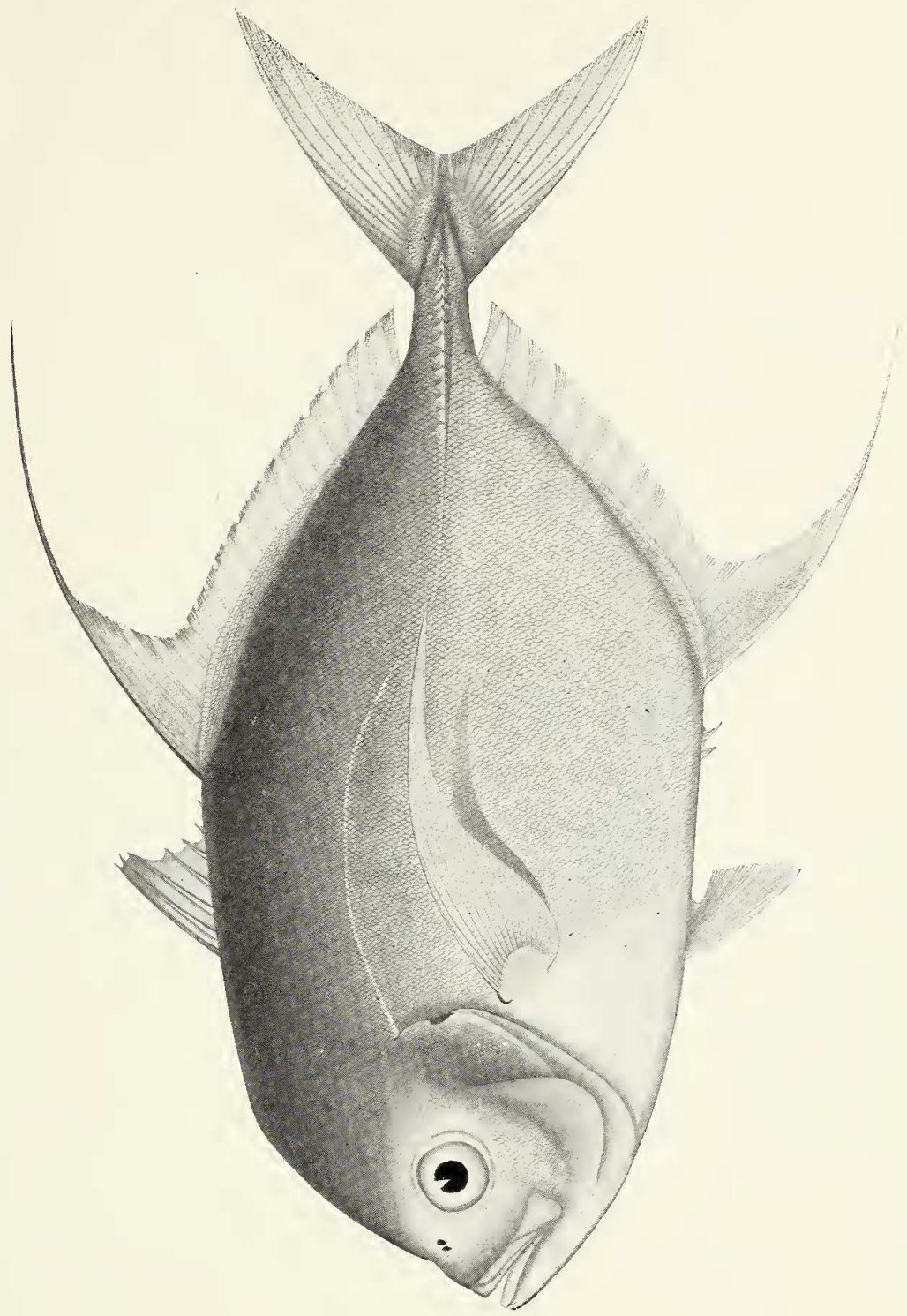


Citula.

PLATE XXI.

Caranx (Citula) ciliaris (Rüppell). Formosa. C. M. Cat. No. 7719. 195 mm.
to base of caudal.

(One-half natural size)



Citula ciliaris.

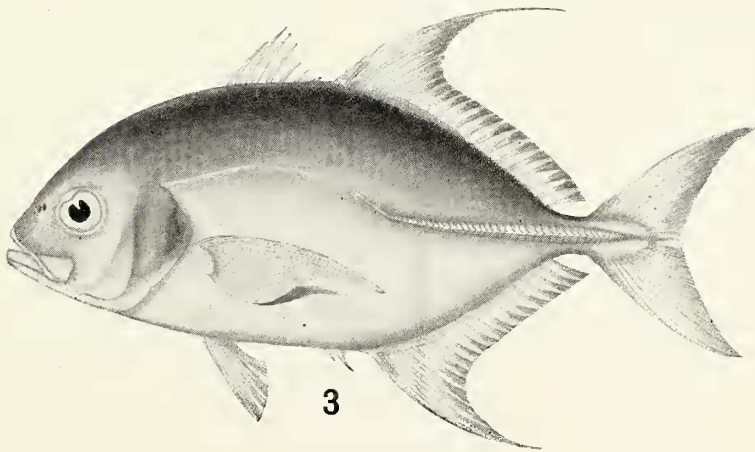
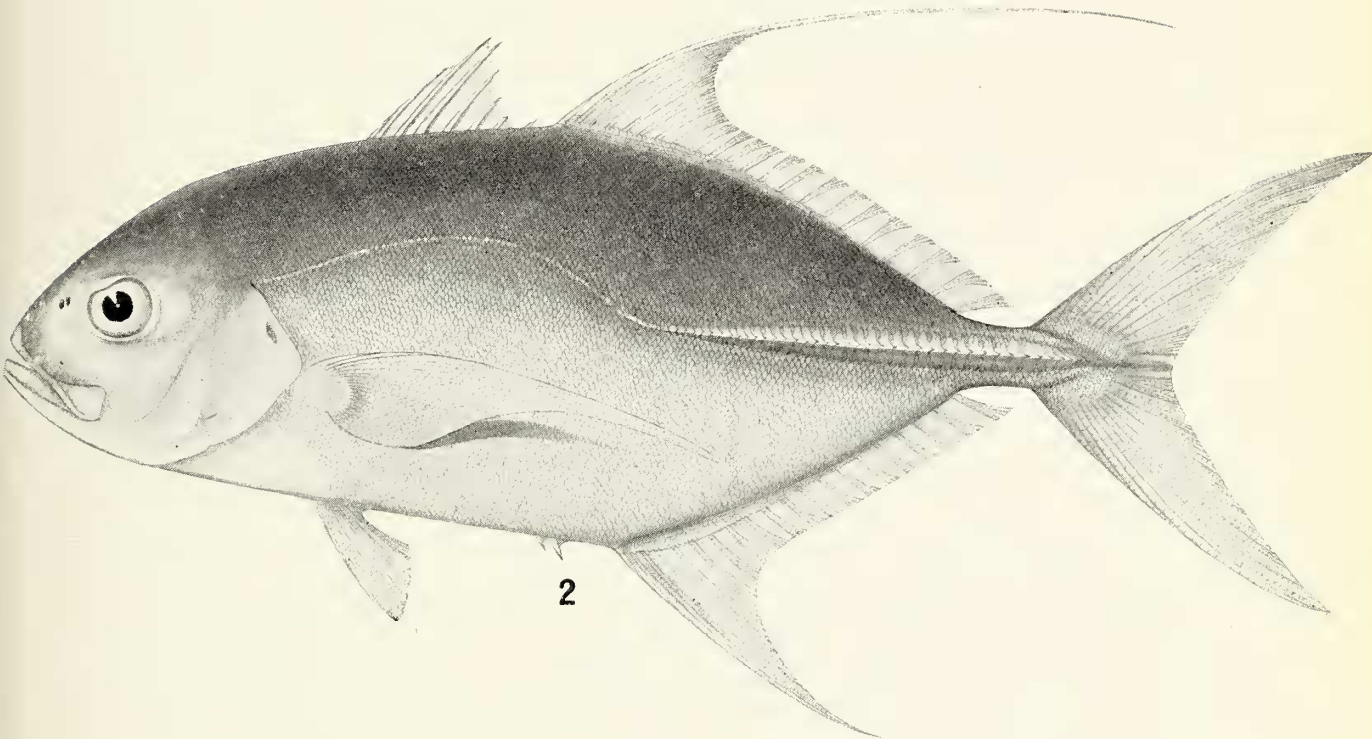
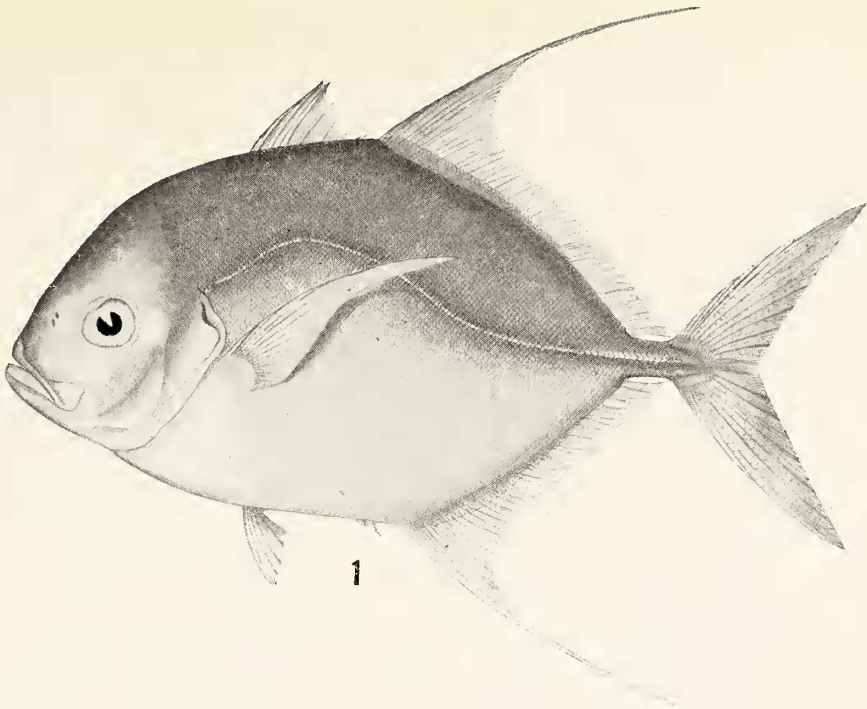
PLATE XXII.

FIG. 1. *Caranx (Citula) uii* Wakiya, *sp. nov.* Type. Kii. C. M. No. 7720. 125 mm. to base of caudal.

FIG. 2. *Caranx (Citula) oblongus* (Cuvier and Valenciennes). Formosa. C. M. No. 7721. 200 mm. to base of caudal.

FIG. 3. *Caranx (Citula) deani* Jordan and Seale. Ryūkyū. C. M. No. 7722. 111 mm. to base of caudal.

(All figures one-half natural size)



Citula.

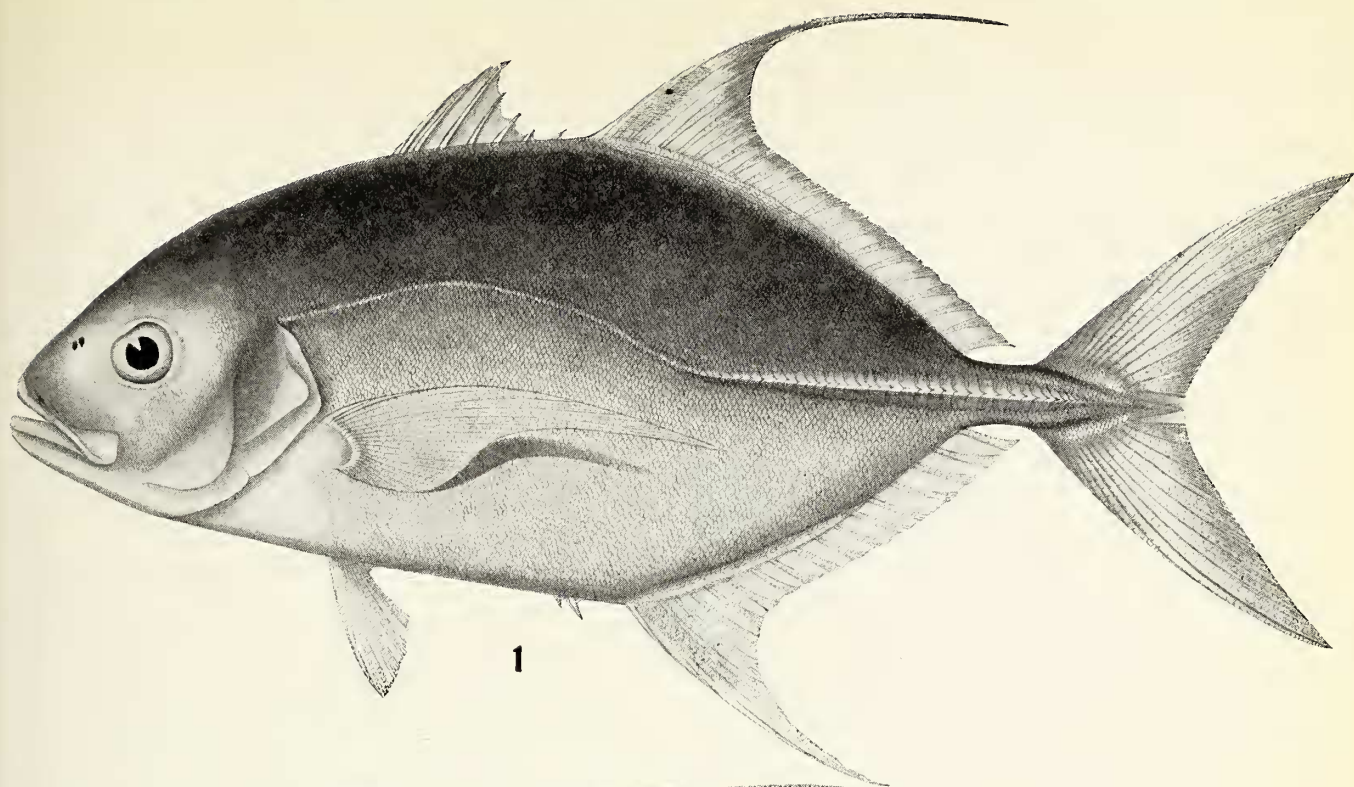
PLATE. XXIII.

FIG. 1. *Caranx (Citula) tanakai* Wakiya, *sp. nov.* Type. Kii. 197 mm. to base of caudal.

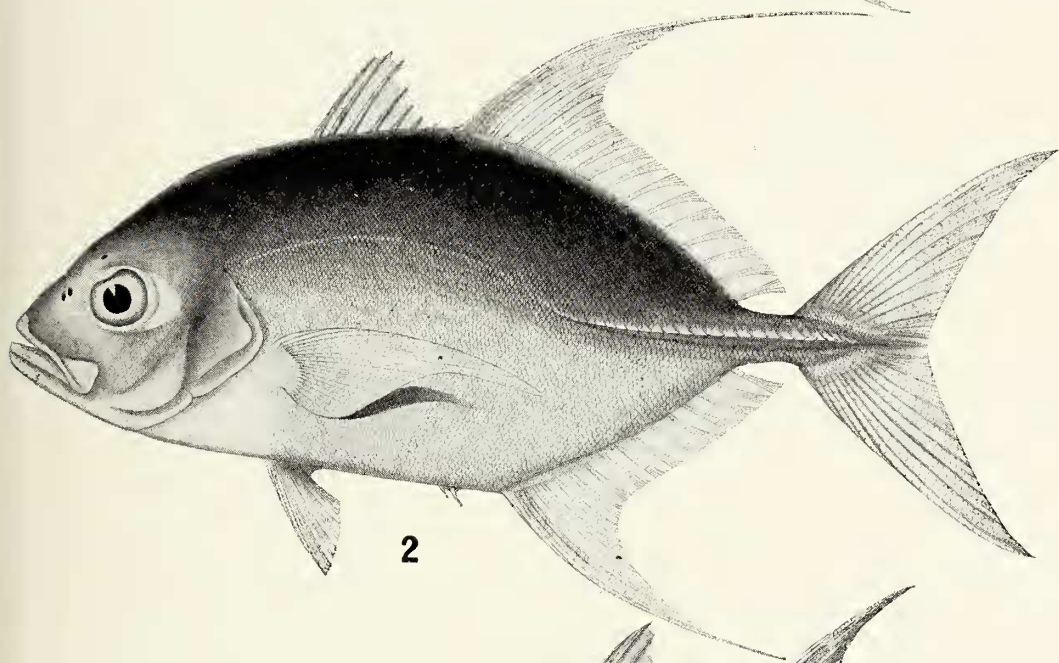
FIG. 2. *Caranx (Citula) dinema* Bleeker. Ryūkyū. C. M. Cat. No. 7724. 154 mm. to base of caudal.

FIG. 3. *Caranx (Citula) malabaricus* Bloch and Schneider. Formosa. C. M. Cat. No. 7725a. 170 mm. to base of caudal.

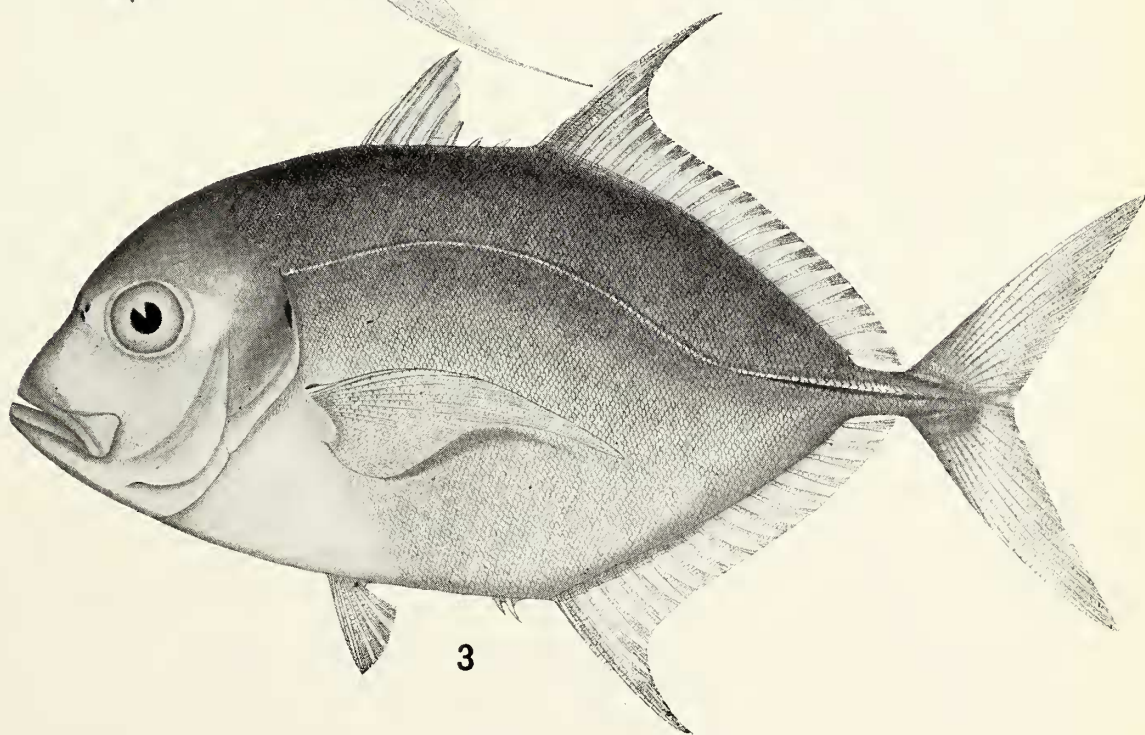
(All figures one-half natural size)



1



2



3

Citula.

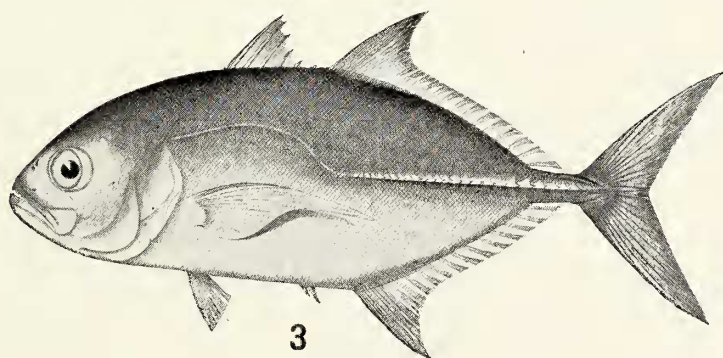
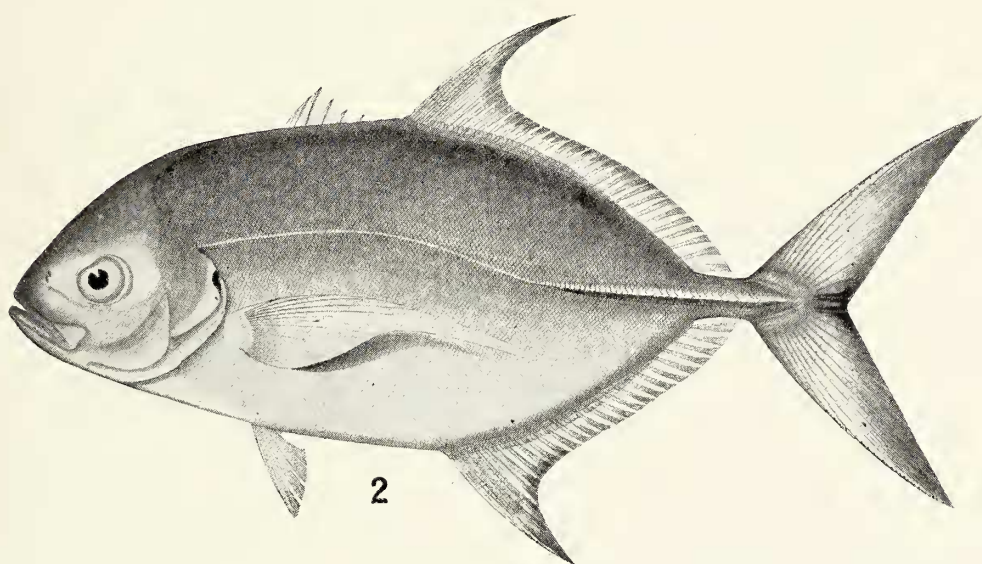
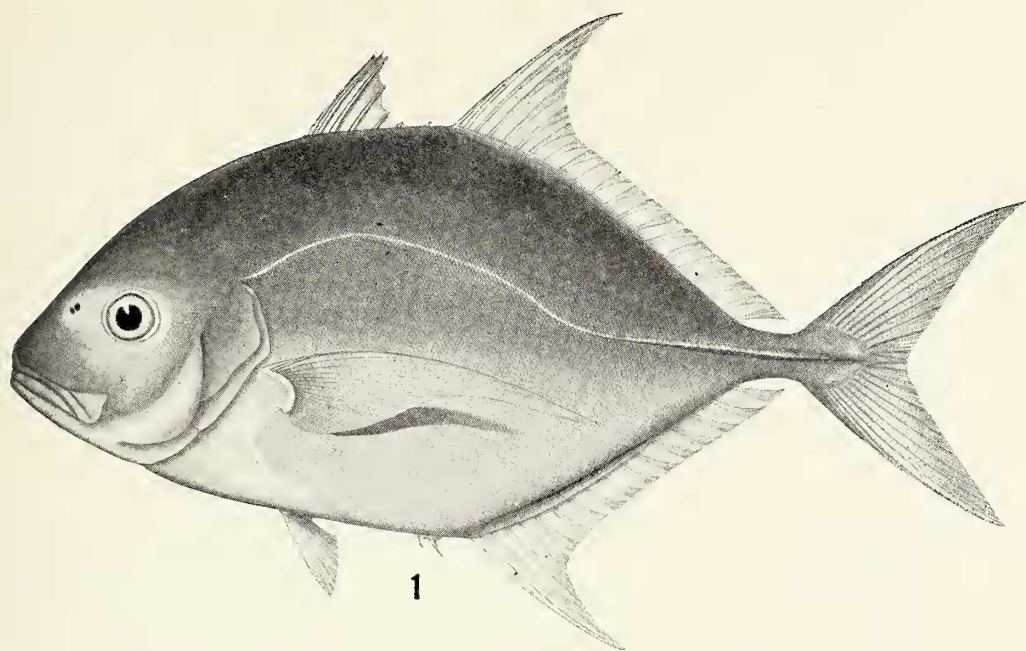
PLATE XXIV.

FIG. 1. *Caranx (Citula) chrysophrys* Cuvier and Valenciennes. Formosa. 157 mm. to base of caudal.

FIG. 2. *Caranx (Citula) hemigymnostethus* (Bleeker). Ryūkyū. C. M. Cat. No. 7727. 212 mm. to base of caudal.

FIG. 3. *Caranx xanthopygus* Cuvier and Valenciennes. Ryūkyū. C. M. Cat. No. 7729. 160 mm. to base of caudal.

(All figures one-third natural size)



Citula and Caranx.

PLATE XXV.

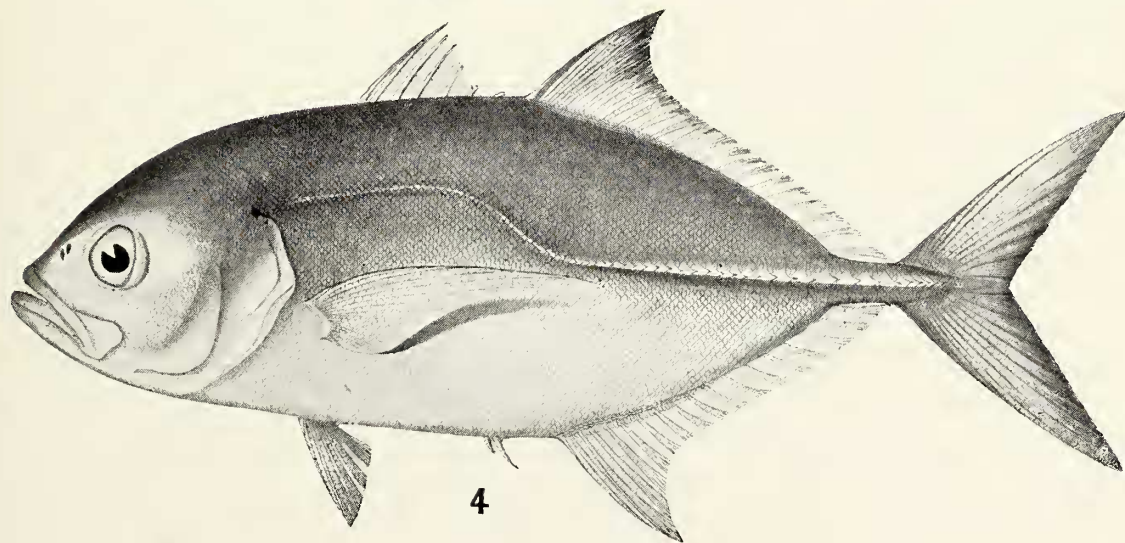
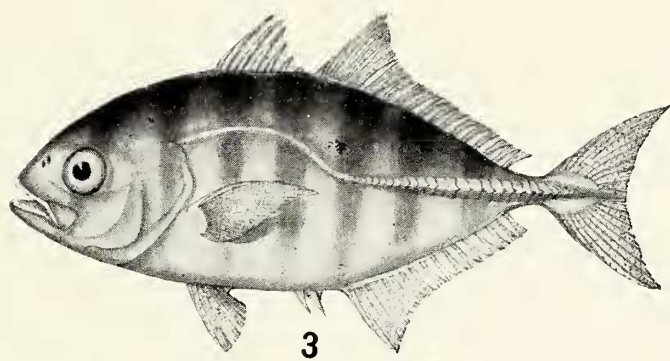
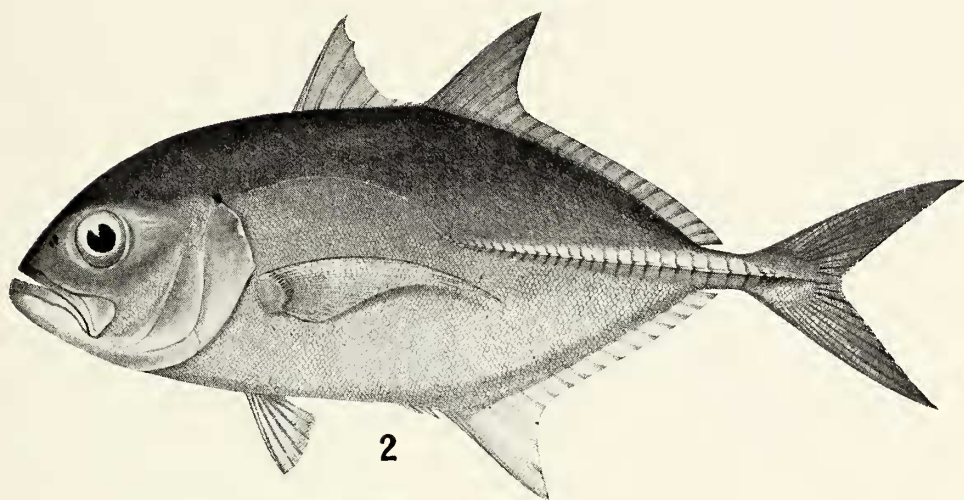
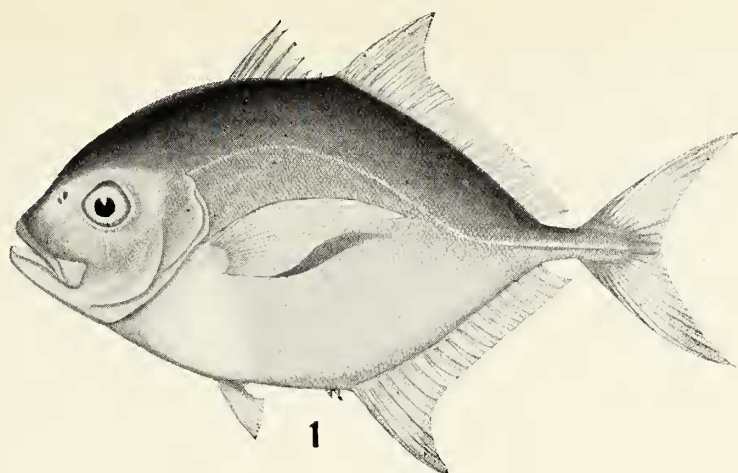
FIG. 1. *Caranx* (*Citula*) *cæruleopinnatus* Rüppell. Uwajima. C. M. Cat. No. 7726. 103 mm. to base of caudal.

FIG. 2. *Caranx lessoni* Cuvier and Valenciennes.

FIG. 3. *Caranx sexfasciatus* Quoy and Gaimard. Kii. C. M. Cat. No. 7728b. Young, 50 mm. to base of caudal.

FIG. 4. *Caranx sexfasciatus* Quoy and Gaimard. Kii. C. M. Cat. No. 7728. 166 mm. to base of caudal.

(Figs. 1, 2, and 3 one-half natural size; fig. 4 natural size)

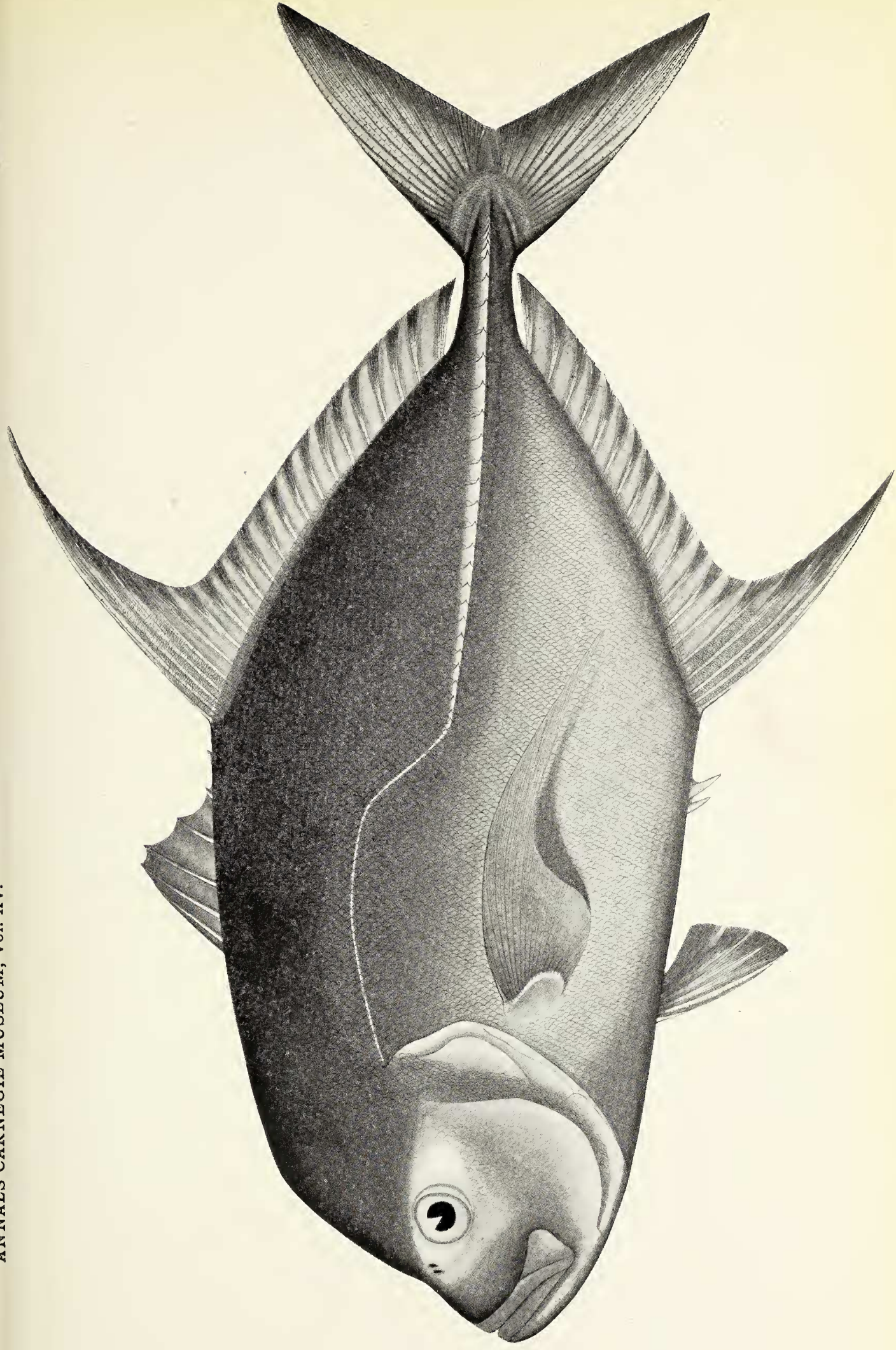


Citula and Caranx

PLATE XXVI.

Caranx ishikawai Wakiya, sp. nov. Type. Bonin Islands. C. M. Cat. No. 7734.
324 mm.

(One-half natural size)



Acanth.

PLATE XXVII.

FIG. 1. *Caranx oshimai*. Wakiya, sp. nov. Type. Formosa. C. M. Cat. No. 7731. 123 mm. to base of caudal.

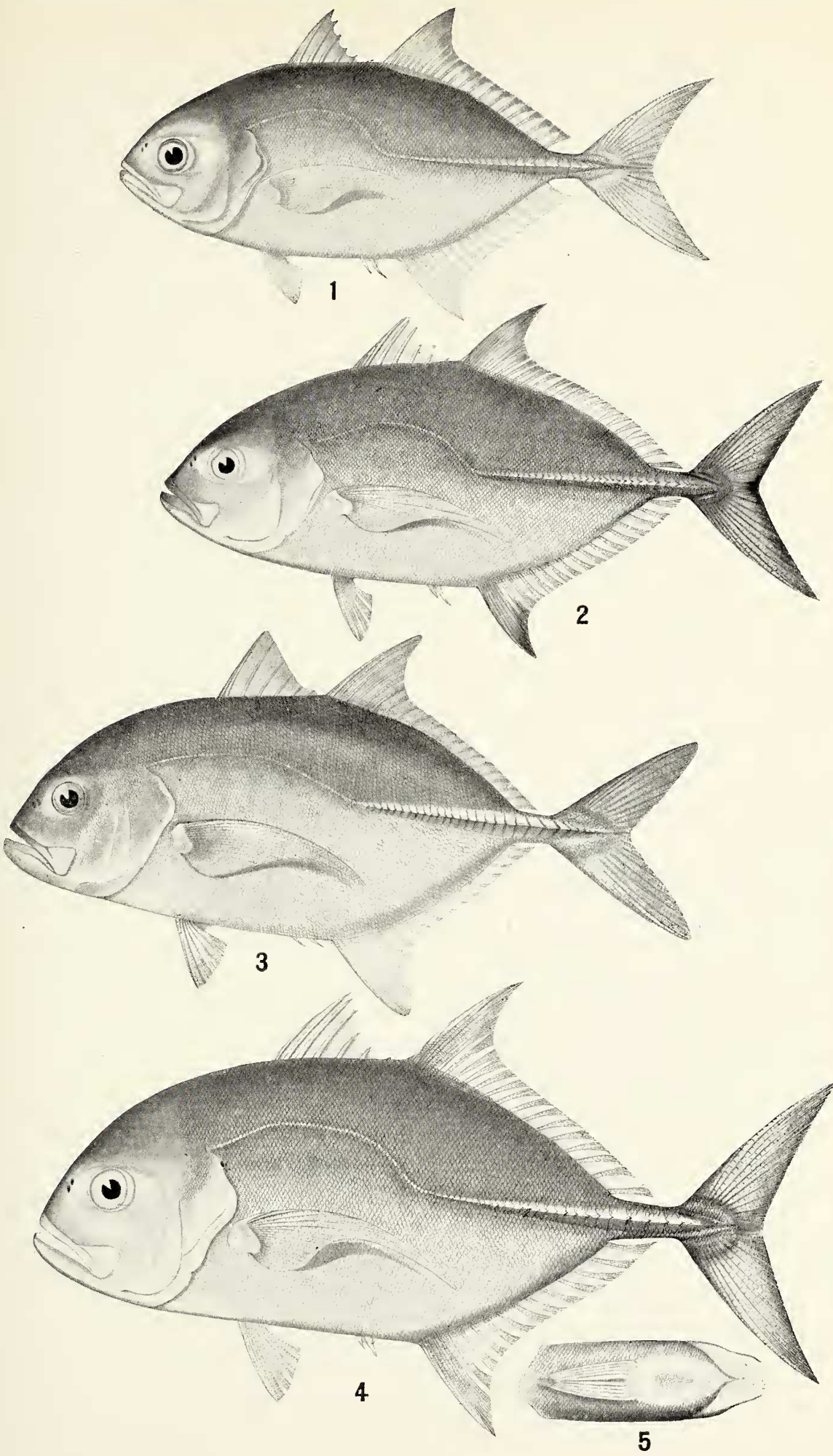
FIG. 2. *Caranx bixanthopterus* Rüppell. Kii. C. M. Cat. No. 7732. 135 mm. to base of caudal.

FIG. 3. *Caranx ignobilis* (Forskål). Nagasaki. C. M. Cat. No. 7735. 147 mm. to base of caudal.

FIG. 4. *Caranx bucculentus* Alleyne and Macleay. Kii. C. M. Cat. No. 7736. 170 mm. to base of caudal.

FIG. 5. View of breast of *C. bucculentus*.

(All figures one-half natural size)



Caranx.

PLATE XXVIII.

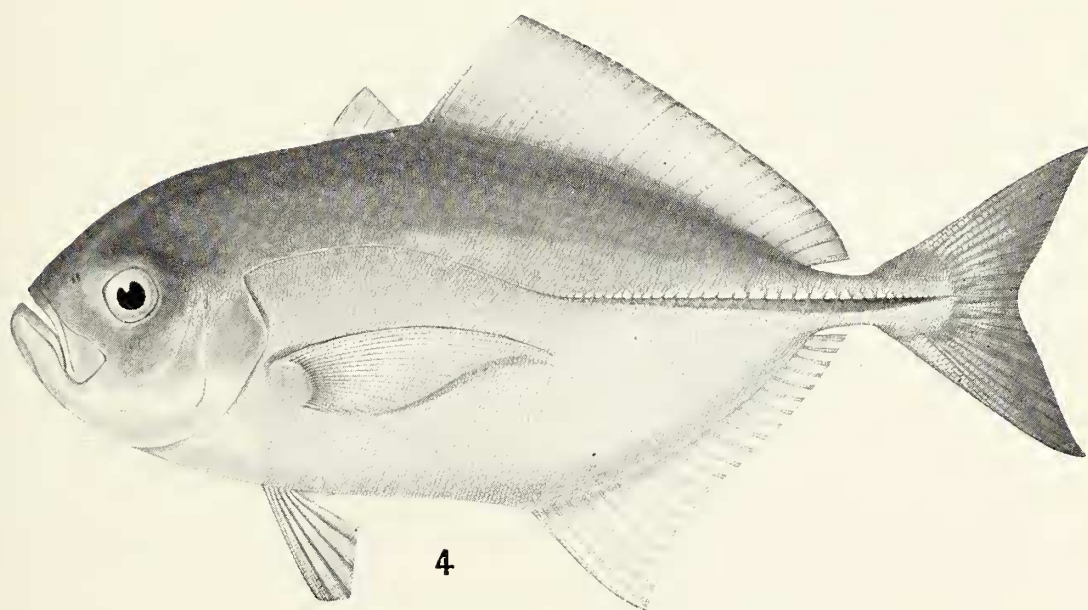
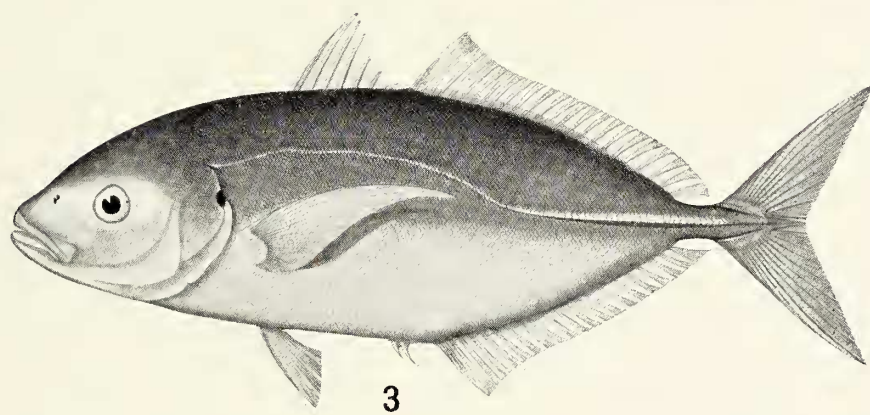
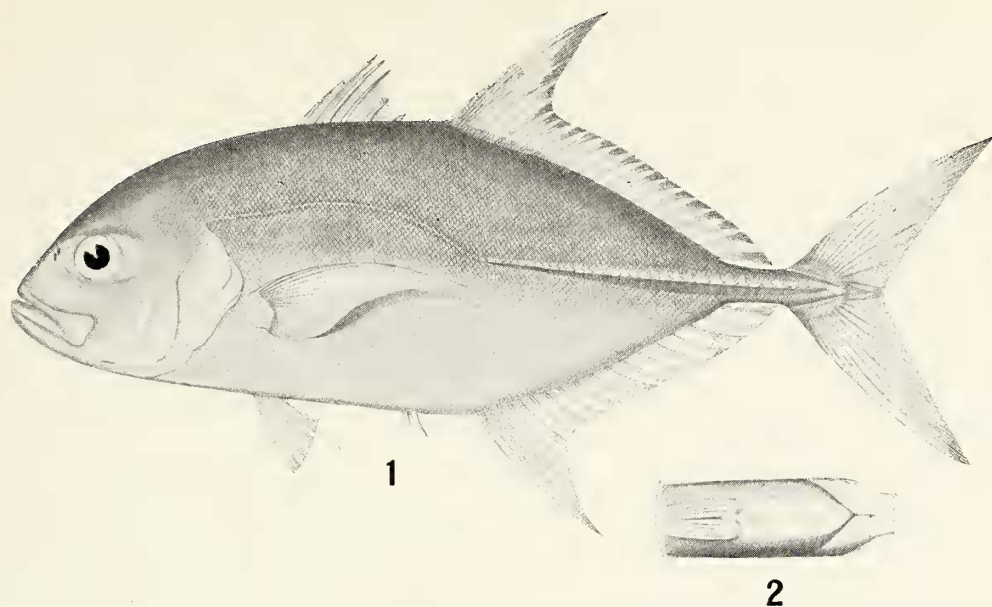
FIG. 1. *Caranx sansun* (Forskål). Ryūkyū. C. M. Cat. No. 7738. 224 mm. to base of caudal.

FIG. 2. Breast of *C. Sansun*.

FIG. 3. *Caranx (Longirostrum) delicatissimus* Döderlein. Kii. C. M. Cat. No. 7744. 200 mm. to base of caudal.

FIG. 4. *Caranx (Uraspis) helvolus* (Forster). Uwajima. C. M. Cat. No. 7746. 250 mm. to base of caudal.

(All figures one-third natural size)



Caranx, *Longirastrum*, and *Uraspis*.

PLATE XXIX.

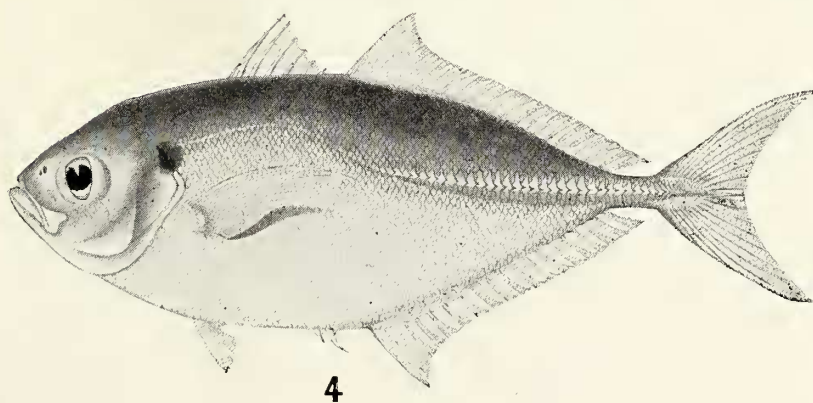
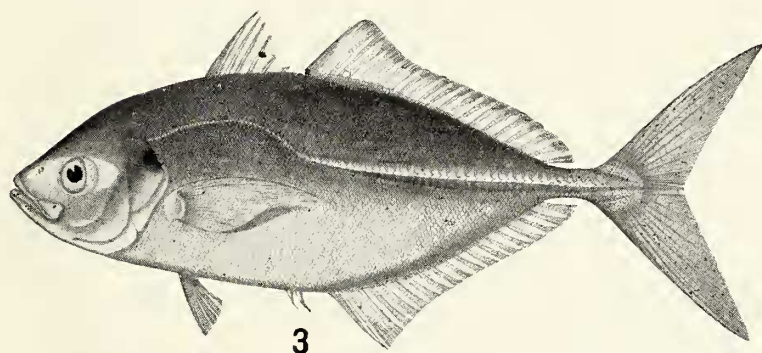
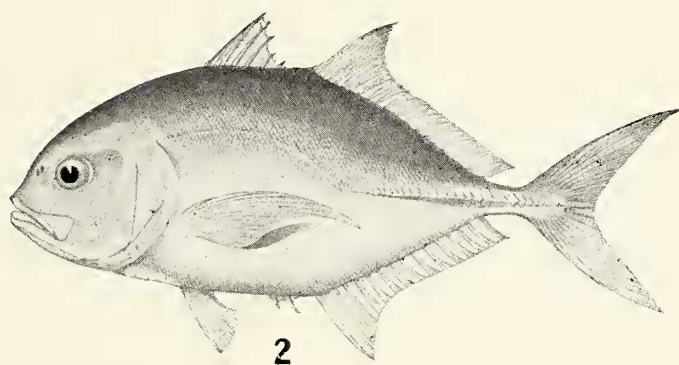
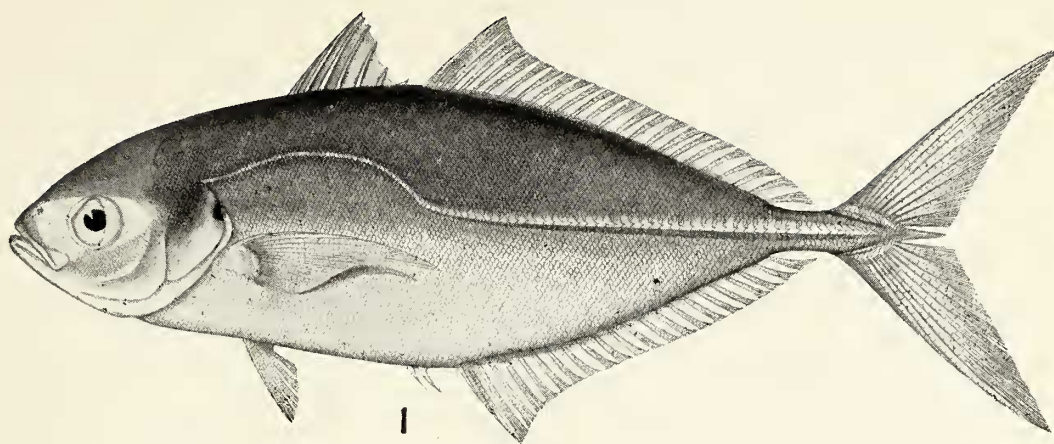
FIG. 1. *Caranx (Atule) djeddaba* (Forskål). Formosa. C. M. Cat. No. 7739. 162 mm. to base of caudal.

FIG. 2. *Caranx jarra* Cuvier and Valenciennes. Bonin Islands. C. M. Cat. No. 7737. 100 mm. to base of caudal.

FIG. 3. *Caranx (Atule) malam* (Bleeker). Formosa. C. M. Cat. No. 7740. 112 mm. to base of caudal.

FIG. 4. *Caranx miyakamii* Wakiya, *sp. nov.* Type. Formosa. C. M. Cat. No. 7742. 119 mm. to base of caudal.

(All figures one-half natural size)



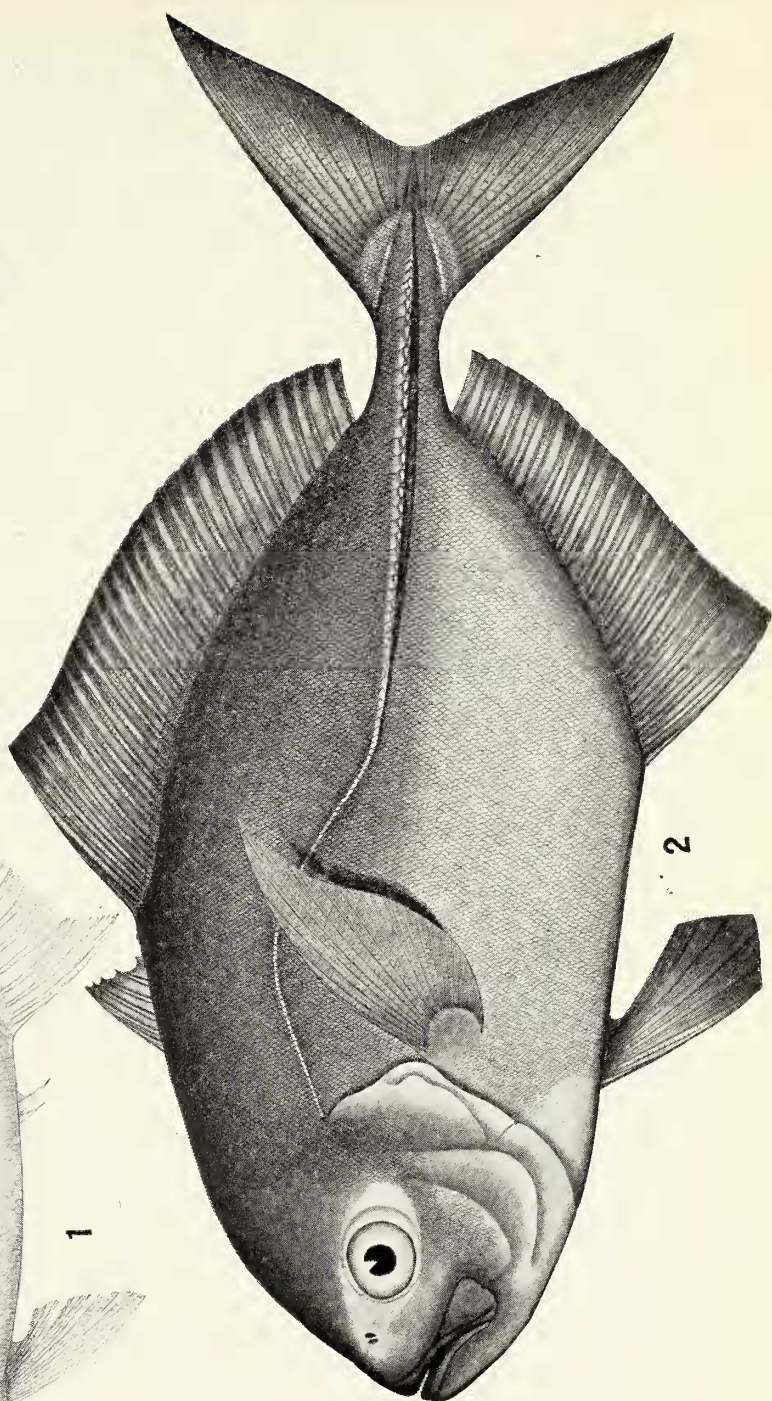
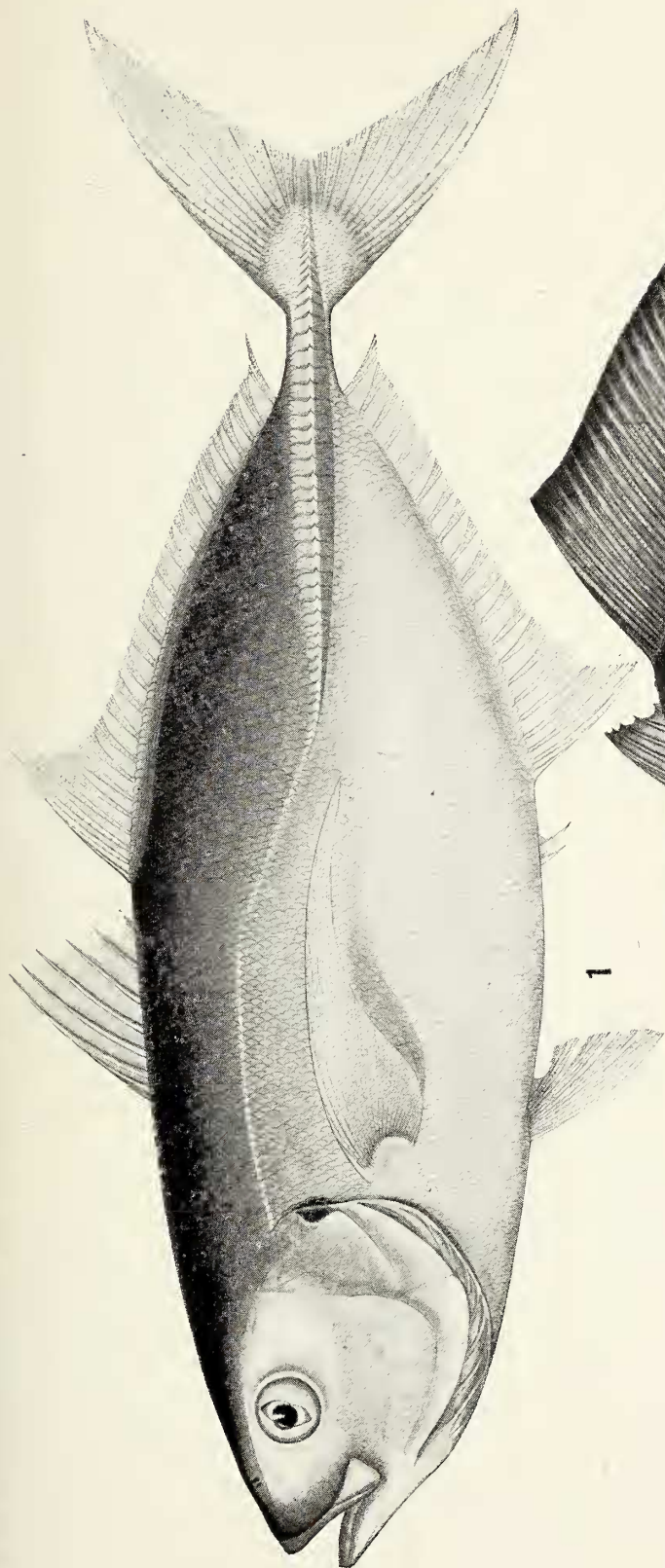
Atule and Caranx.

PLATE XXX.

FIG. 1. *Caranx (Atule) affinis* Rüppell. Formosa. C. M. Cat. No. 7741.
244 mm. to base of caudal.

FIG. 2. *Caranx (Uraspis) micropterus* Rüppell. Kii. C. M. Cat. No. 7747.
210 mm. to base of caudal.

(Both figures one-half natural size)



Atule and Uraspis.

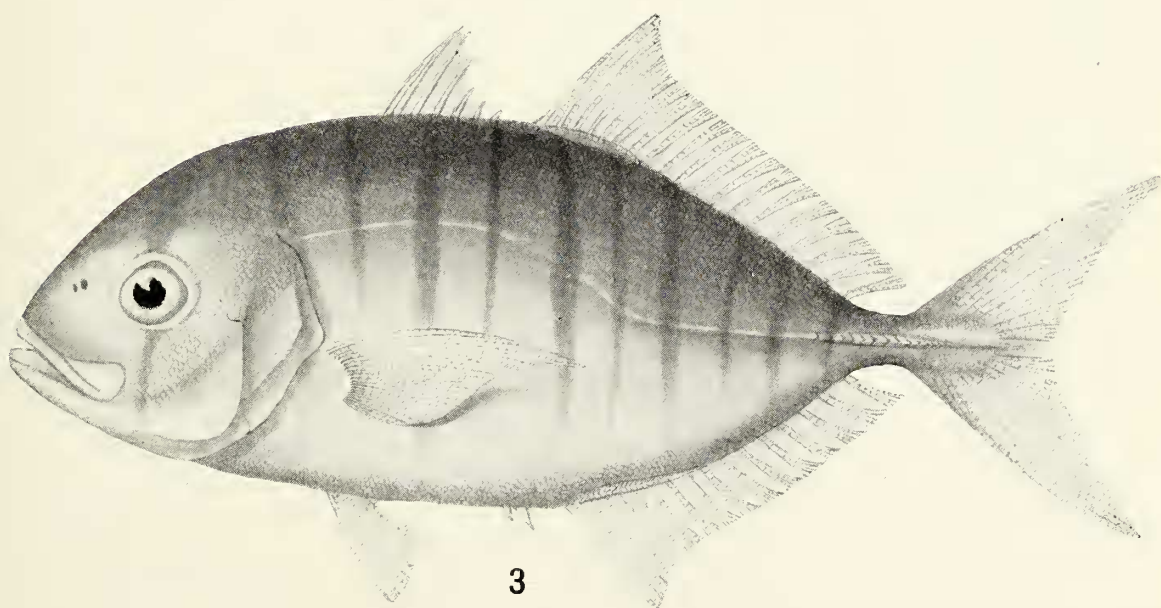
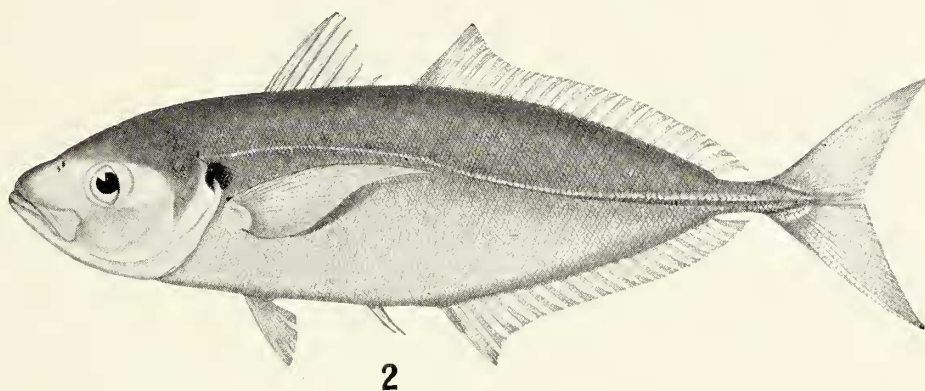
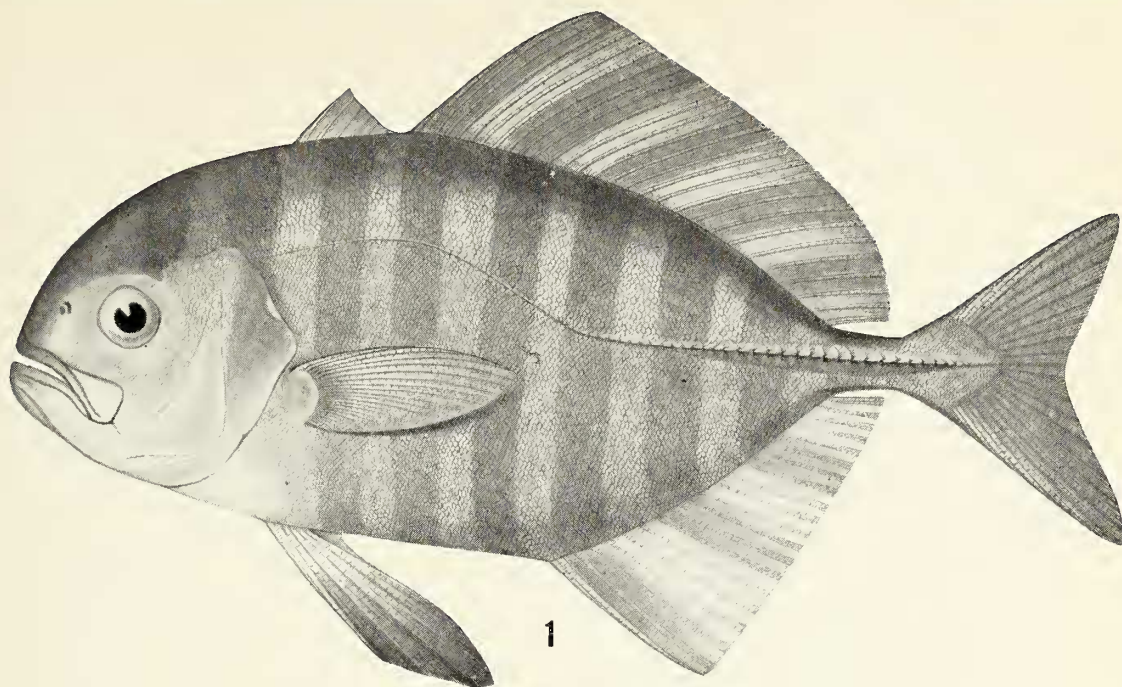
PLATE XXXI.

FIG. 1. *Caranx (Uraspis) uraspis* Günther. Nagasaki. C. M. Cat. No. 7748. 172 mm. to base of caudal.

FIG. 2. *Caranx (Selaroides) leptolepis* Cuvier and Valenciennes. Ryūkyū. C. M. Cat. No. 7749. 141 mm. to base of caudal.

FIG. 3. *Caranx (Gnathanodon) speciosus* (Forskål) Formosa. 85 mm. to base of caudal.

(Figs. 1 and 2 one-half natural size. Fig. 3 natural size)



Uraspis, Selaroides, and Gnathanodon.

PLATE XXXII.

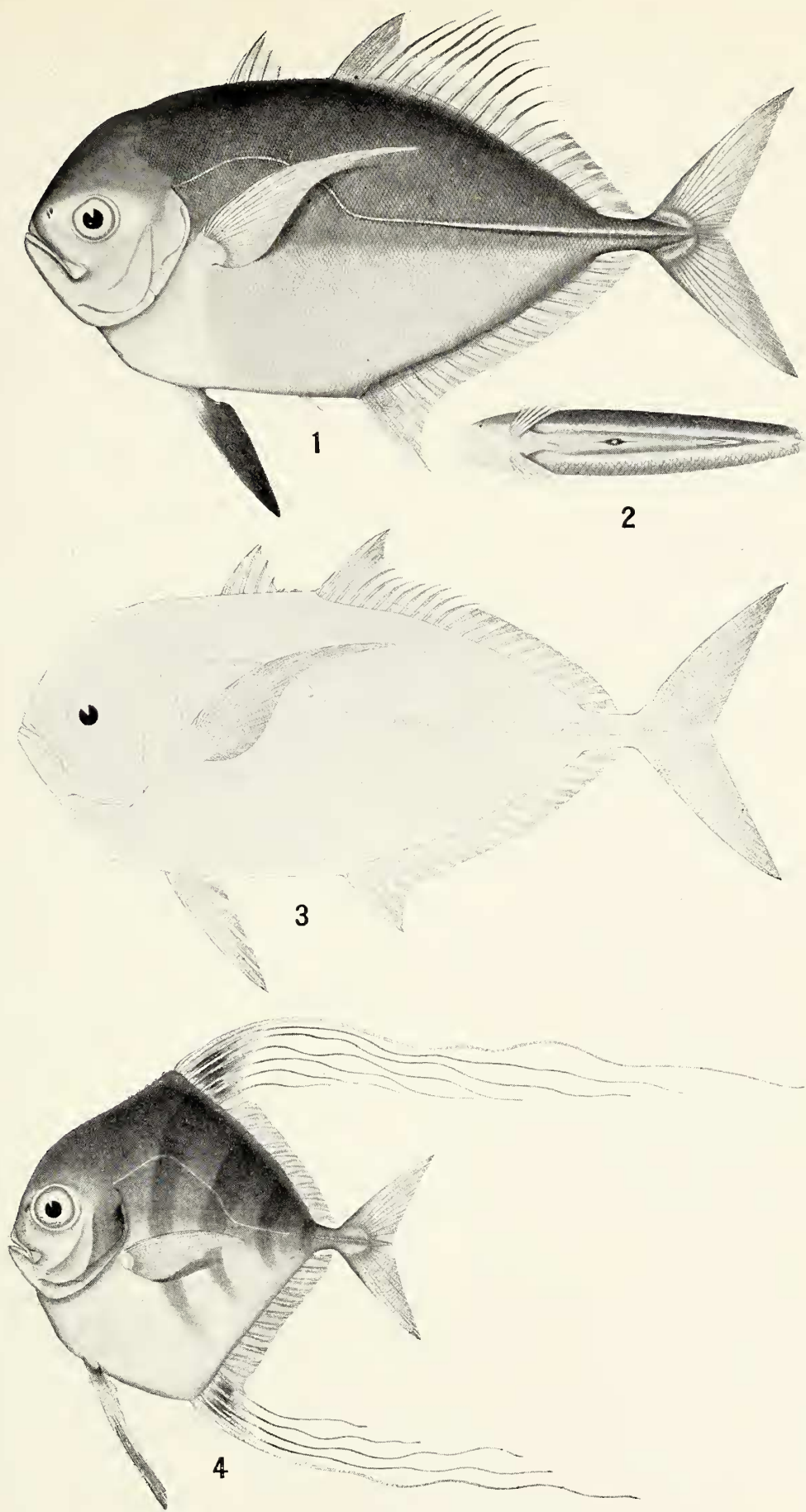
FIG. 1. *Atropus atropus* (Bloch and Schneider) Formosa. C. M. Cat. No. 7750. 214 mm. to base of caudal.

FIG. 2. Breast of *Atropus atropus*.

FIG. 3. *Atropus atropus*. Female.

FIG. 4. *Alectis ciliaris* (Bloch). Bonin Islands. C. M. Cat. No. 7751. 78 mm. to base of caudal.

(Figs. 1 and 3 one-third natural size. Figs. 2 and 4 one-half natural size)

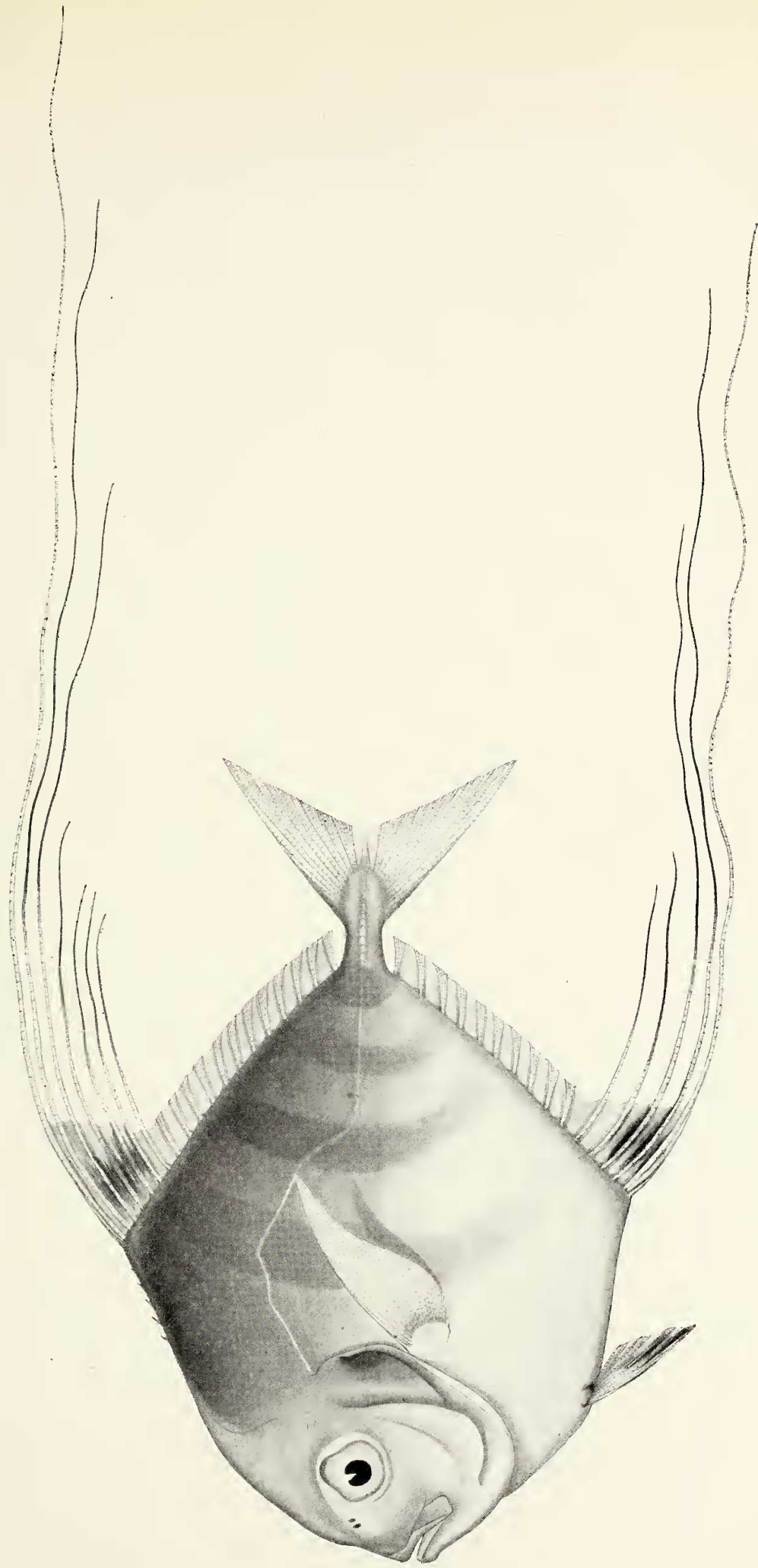


Atropus and Alectis.

PLATE XXXIII.

Alectis breviventralis Wakiya, *sp. nov.* Type. Kii. C. M. Cat. No. 7753. 116 mm.
to base of caudal.

(Figure reduced)



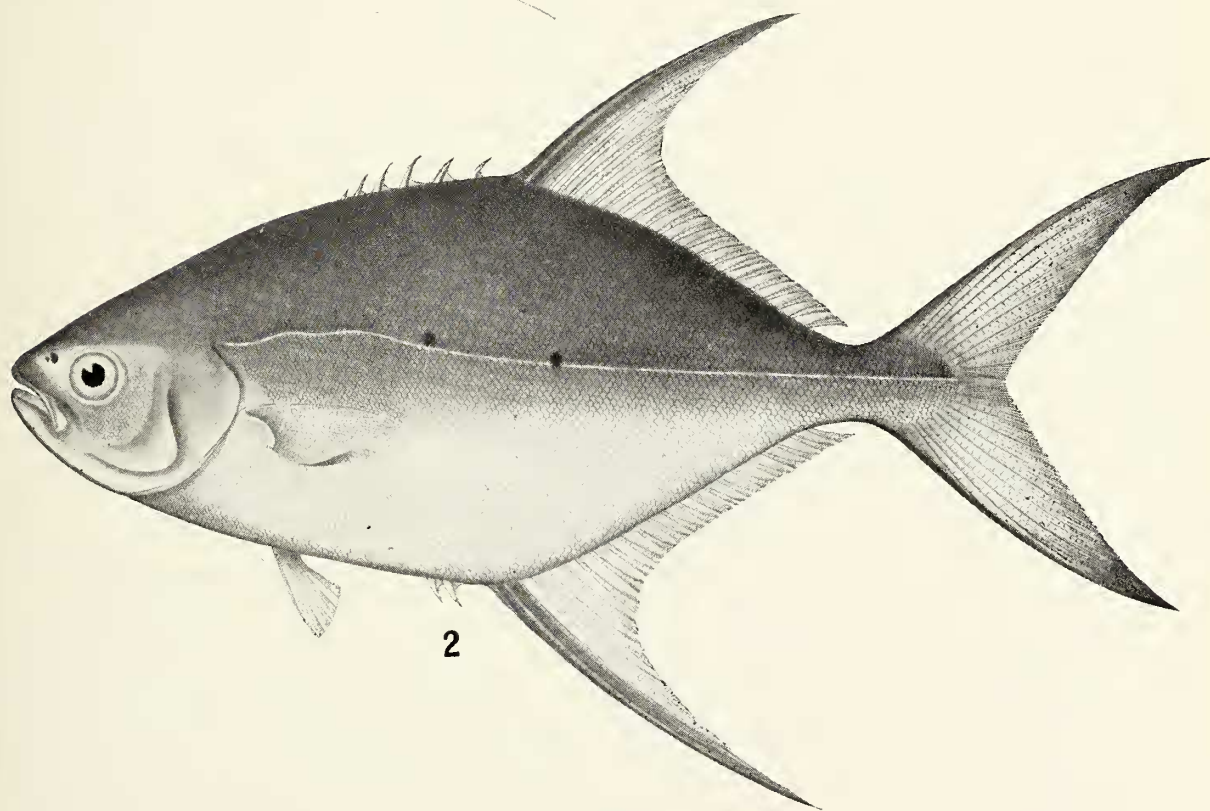
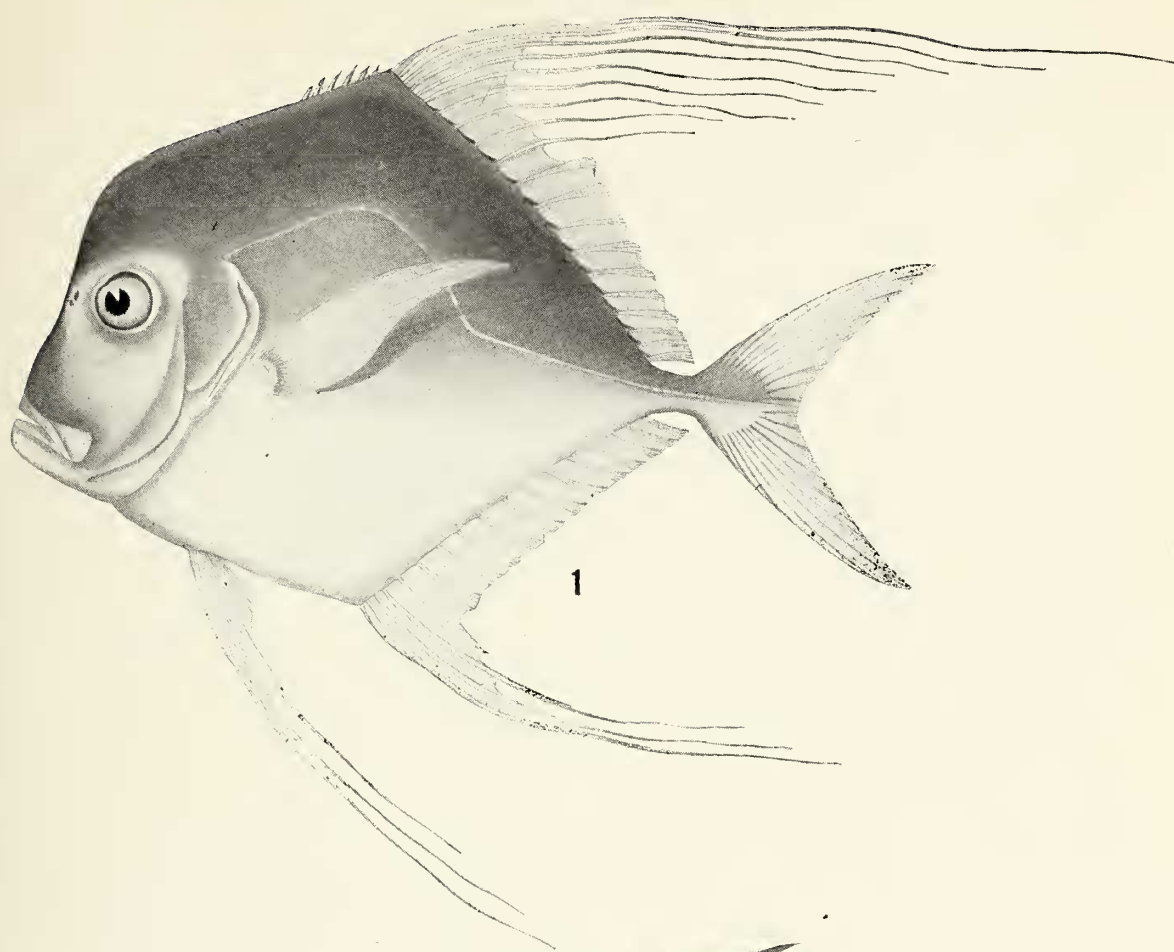
Alectis.

PLATE XXXIV.

FIG. 1. *Alectis major* (Cuvier and Valenciennes). Formosa. C. M. Cat. No. 7754. 130 mm. to base of caudal.

FIG. 2. *Trachynotus quadripunctatus* (Rüppell). Kii. C. M. Cat. No. 7755. 160 mm. to base of caudal.

(Both figures one-half natural size)



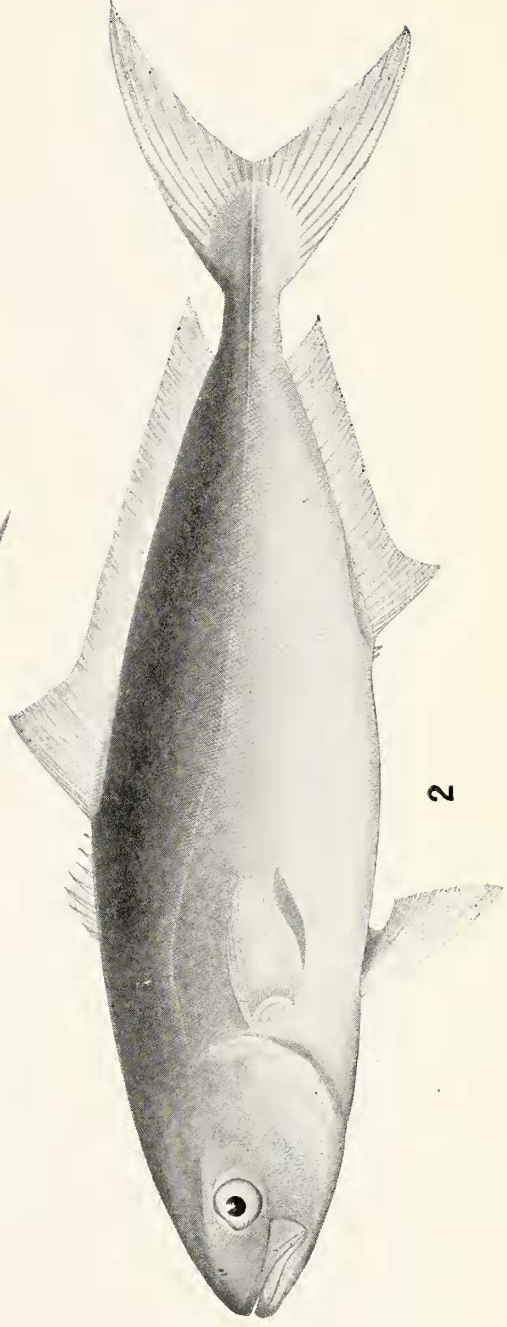
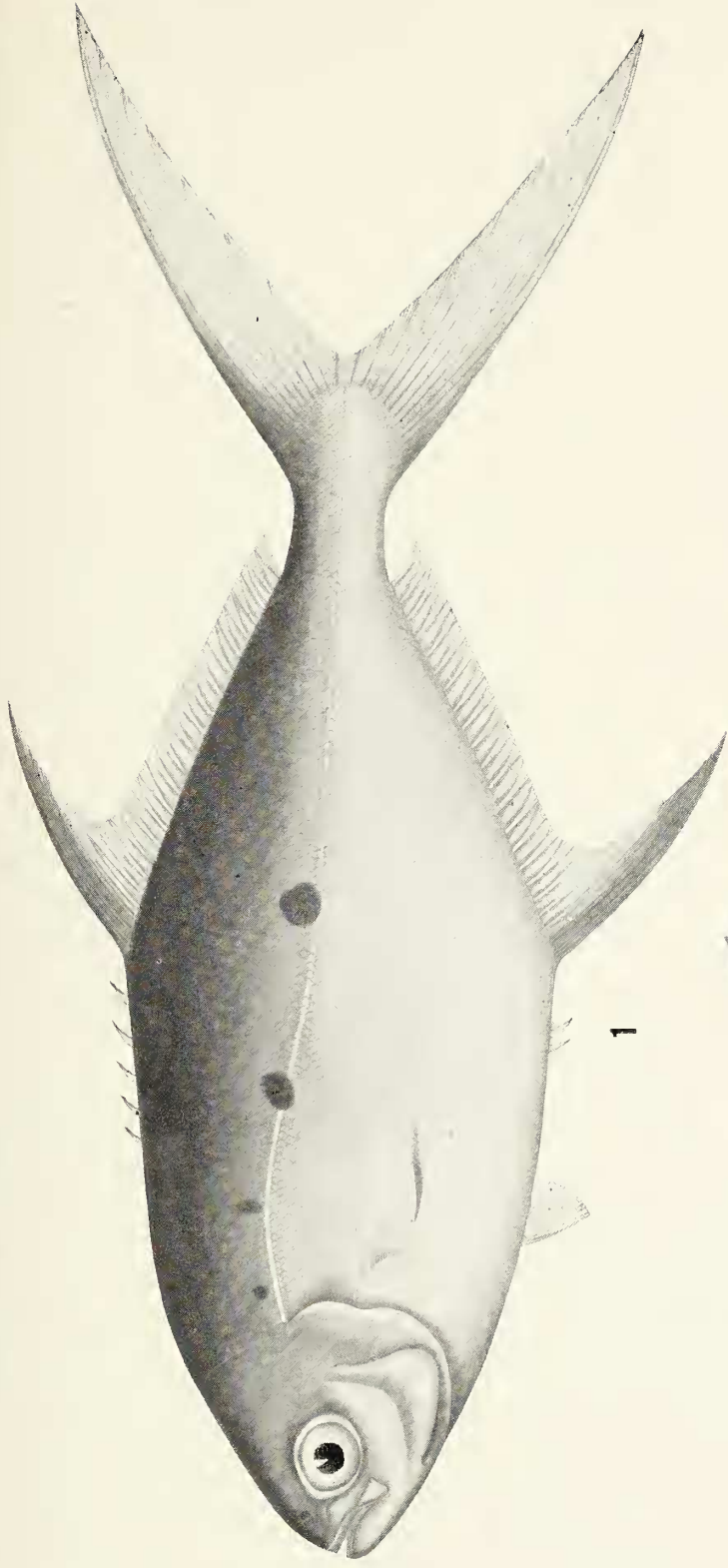
Alectis and *Trachynotus*.

PLATE XXXV.

FIG. 1. *Trachynotus jordani* Wakiya, *sp. nov.* Type. Bonin Islands. C. M. Cat. No. 7756. 297 mm. to base of caudal.

FIG. 2. *Seriola aureovittata* Temminck and Schlegel. Kii. C. M. Cat. No. 7757. 300 mm. to base of caudal.

(Figures one-third natural size)



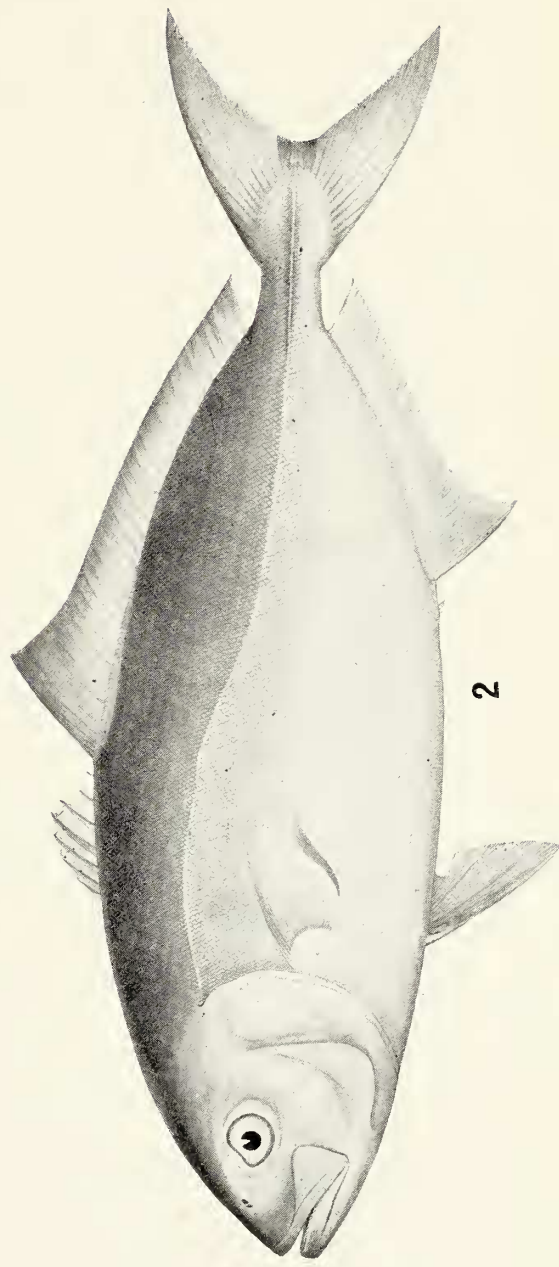
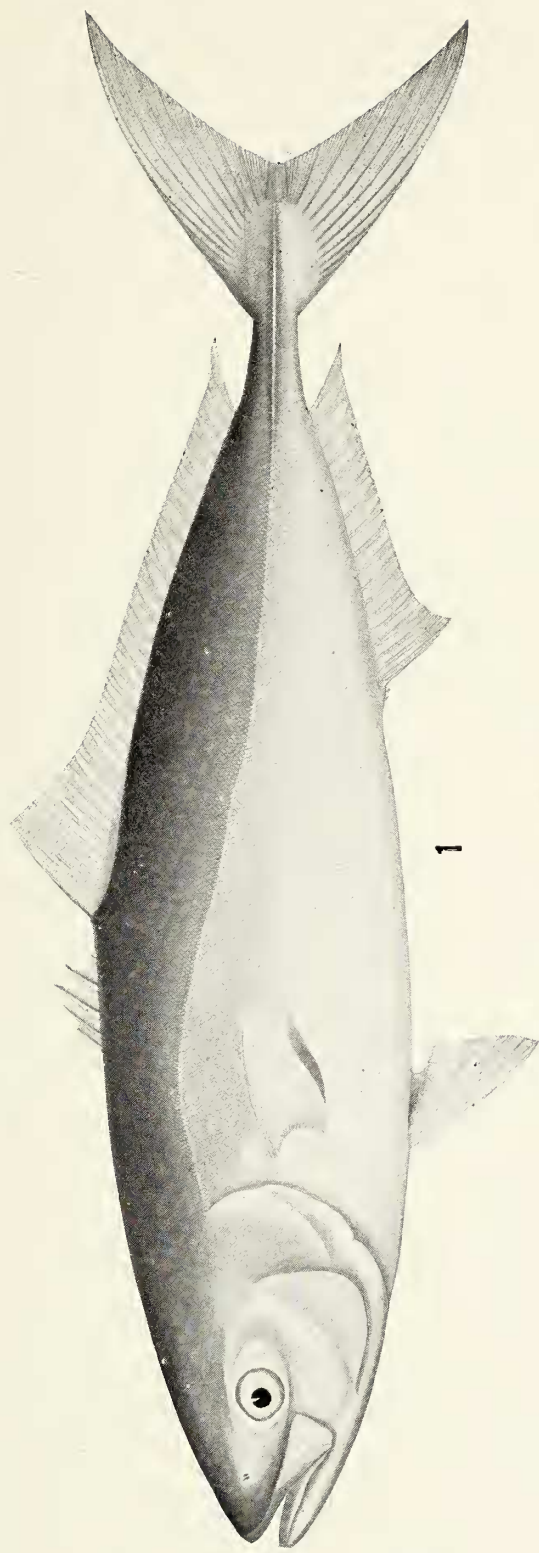
Trachynotus and Seriola.

PLATE XXXVI.

FIG. 1. *Seriola quinqueradiata* Temminck and Schlegel. Kii. C. M. Cat.
No. 7758. 350 mm. to base of caudal.

FIG. 2. *Seriola purpurascens* Temminck and Schlegel. Kii. C. M. Cat.
No. 7759. 285 mm. to base of caudal.

(Figures one-third natural size)



Seriola.

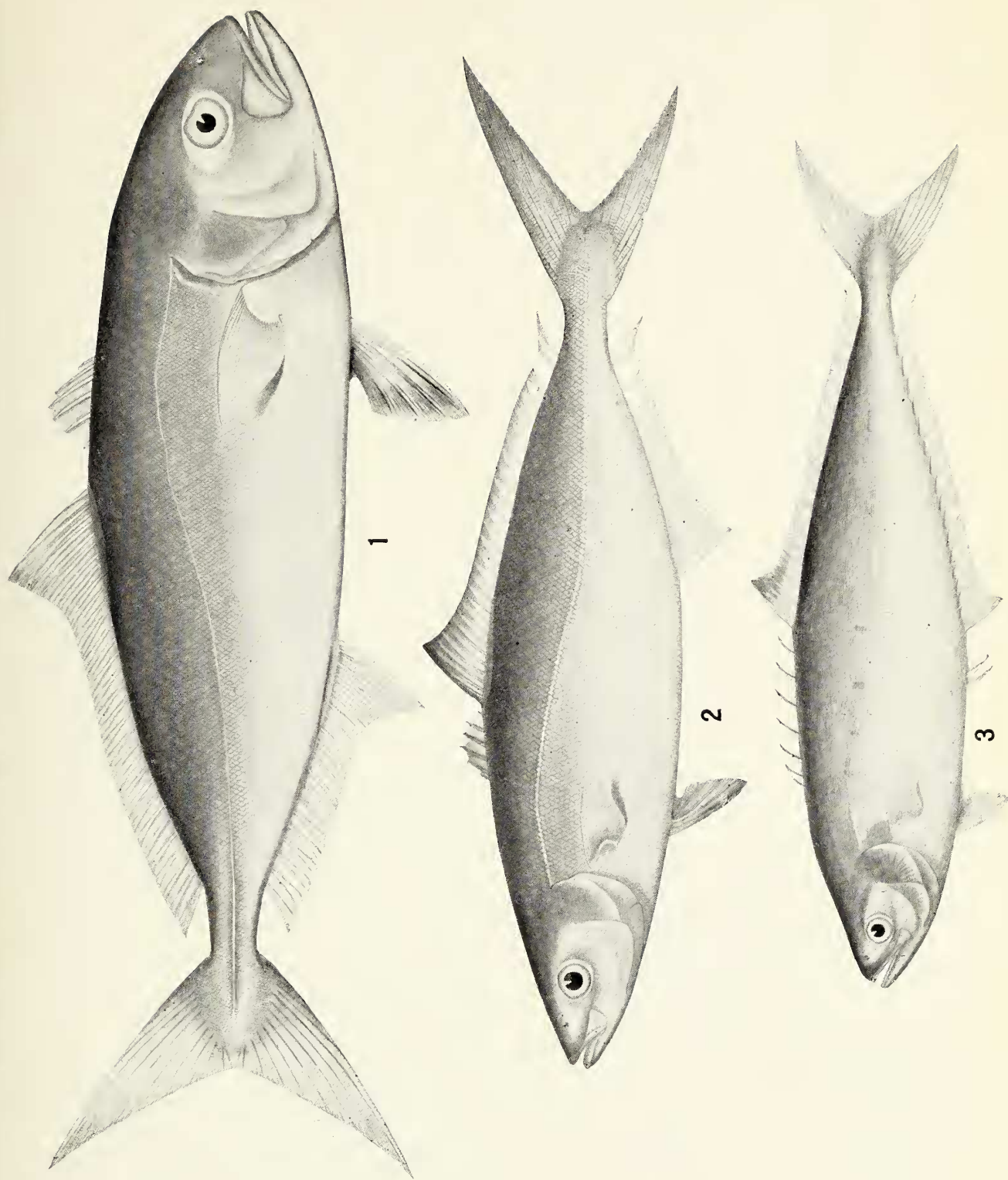
PLATE XXXVII.

FIG. 1. *Seriola cristata* Döderlein. Sagami Bay. C. M. Cat. No. 7760. 344 mm. to base of caudal.

FIG. 2. *Elegatis bipinnulata* (Quoy and Gaimard). Kii., C. M. Cat. No. 7763. 278 mm. to base of caudal.

FIG. 3. *Scomberoides moadetta* (Cuvier and Valenciennes). Formosa. 285 mm. to base of caudal.

(Figures one-third natural size)



Seriola, Elegatis, Scomberoides.

PLATE XXXVIII.

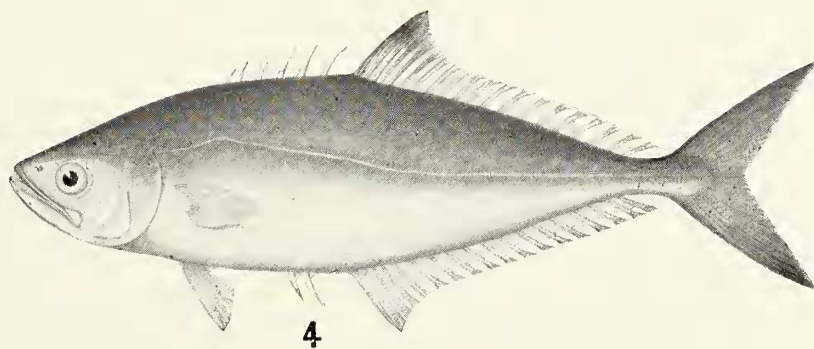
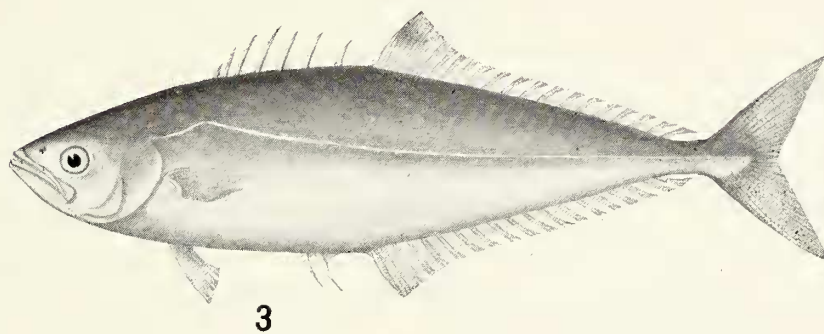
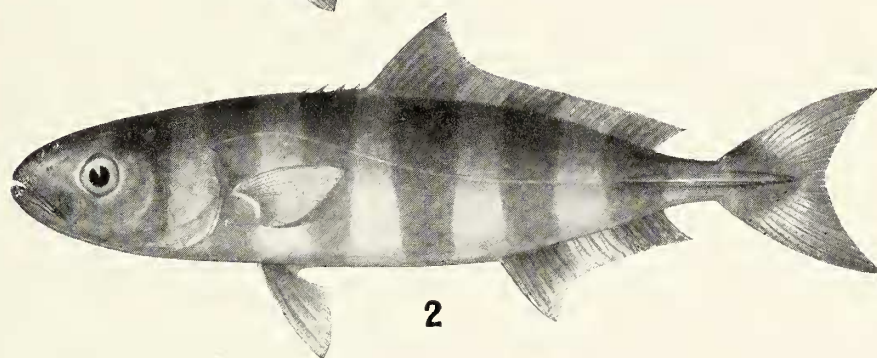
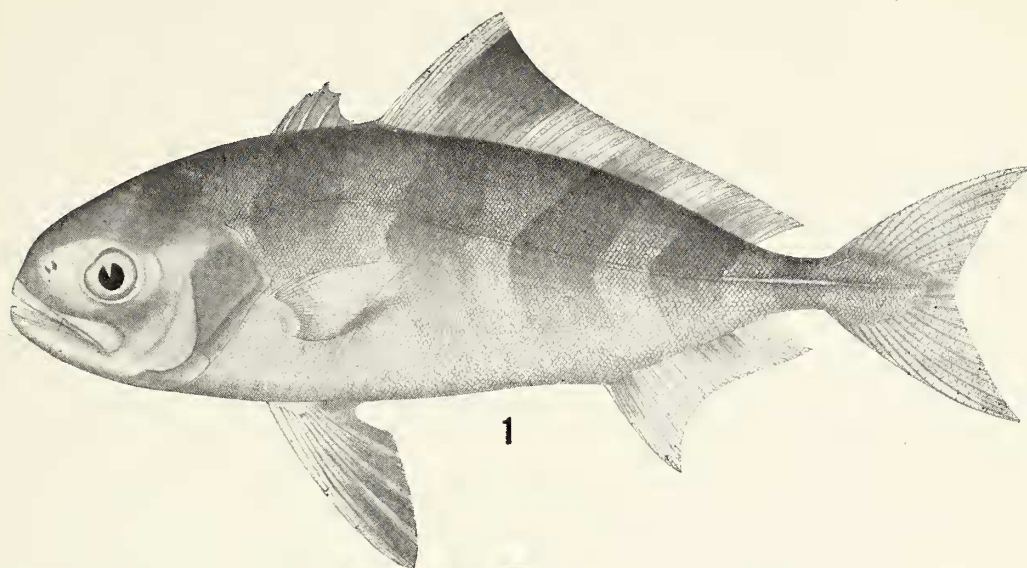
FIG. 1. *Seriolina intermedia* (Temminck and Schlegel). Kii. C. M. Cat. No. 7761. 156 mm. to base of caudal.

FIG. 2. *Naucrates indicus* Cuvier and Valenciennes. Kii. C. M. Cat. No. 7762. 135 mm. to base of caudal.

FIG. 3. *Scomberoides formosanus* Wakiya, *sp. nov.* Type. Kii. C. M. Cat. No. 7765. 130 mm. to base of caudal.

FIG. 4. *Scomberoides orientalis* (Temminck and Schlegel). Kii. C. M. Cat. No. 7766. 125 mm. to base of caudal.

(All figures one-half natural size)



Seriolina, Naucrates, Scomberoides.